

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

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UNITED STATES OF AMERICA,

Plaintiff,

- against -

Civil Action

No. CV- 07-0835

AGI-VR/WESSON COMPANY;
ALLOY CARBIDE COMPANY;
CHI MEI CORPORATION;
CLIMAX MOLYBDENUM COMPANY;
CLIMAX MOLYBDENUM MARKETING
CORPORATION;
COUNTY OF NASSAU, NEW YORK;
CYPRUS AMAX MINERALS COMPANY;
GENERAL ELECTRIC COMPANY;
GTE CORPORATION;
H.C. STARCK, INC.;
KENNAMETAL INC.;
M & R INDUSTRIES, INC.;
MINMETALS INC.;
OSRAM SYLVANIA CORPORATION;
PHILIPS ELECTRONICS NORTH
AMERICA CORPORATION;
SANDVIK AB;
TDY HOLDINGS, LLC; and
TDY INDUSTRIES, INC.,

(Seybert, J.)
(Orenstein, Ch. M. J.)

Defendants.

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APPENDIX D PART 6 TO THE CONSENT JUDGMENT

*Health and Safety Contingency Plan
Li-Tungsten Superfund Site
Glen Cove, New York*

4.4.6 Spiders

Personnel will be alert to the potential for spider bites. Spiders sometimes establish residence in stored clothing and PPE. It is advisable for personnel to inspect clothing and PPE for spiders prior to donning. Spider bites are rarely fatal, but in sensitive individuals a severe reaction is possible.

5.0 TRAINING

Personnel entering the EZ or CRZ will have personnel training in accordance with the training requirements of 29 CFR 1910.120 (e), 29 CFR 1926.65(e), and 29 CFR 1926.21, including:

- OSHA 40-Hour Hazardous Waste Operations Training with a minimum of three (3) days of supervised hazardous waste work for all personnel;
- OSHA 8-Hour Refresher Training for all personnel who completed OSHA 40-Hour training more than 12 months previously; and
- OSHA 8-Hour Supervisor Training for the PM and any other field personnel assigned supervisory duties during the project.

In addition, the following training requirements will be satisfied:

- All field personnel assigned to the project will be informed of, and trained on the content and application of the HSCP, will receive a copy of the HSCP, and will sign a HSCP Compliance Agreement (Attachment A) upon completion of this training;
- The HSO will receive sufficient training to be proficient in the use and maintenance of the necessary monitoring equipment and interpretation of data required to implement the HSCP;
- Specific information on health concerns presented by Ra-226, Th-232, lead, and arsenic, and the purposes and uses for personal air monitoring; and
- Specific OSHA training as needed for fall protection, scaffolds, ladder safety, confined space hazard recognition and entry requirements, and operation of equipment, including vertical and articulated man lifts.

All required training will be documented and ECC will maintain copies of all training certificates, medical clearance records, and training forms at the Project Office.

5.1 Tailgate Safety Meetings

The HSO will conduct a Tailgate Safety Meeting with all field personnel at the beginning of every shift and when job conditions change. An outline of a safety meeting is as follows:

- Work tasks/schedule;
- Site safety responsibilities;
- Medical surveillance program;
- Review of ECC's HSCP including safety/health procedures and changes to plan;
- Potential chemical/physical/biological hazards;
- Review of the activity hazard analysis for the task(s) to be performed;

- Update on air monitoring results;
- PPE/respiratory protection;
- Personal/equipment decontamination;
- Review of safety discrepancies and accidents;
- Emergency assistance network; and
- Discussion of Heat and Cold stress (whichever is appropriate), including symptoms of the exposure, physiological effects, and body safety requirements.

All site visitors will be required to attend briefings on the site operations and the Daily Tailgate Safety Meeting prior to entering a designated EZ.

All personnel present at each Tailgate Safety Meeting will be required to sign the Tailgate Safety Meeting Form. A copy of the minutes for each Tailgate Safety Meeting will be made available to all field personnel and site visitors, will be maintained on-site during the project, and will be provided upon request.

5.2 Hazard Communication

ECC maintains a Hazard Communication Program for its employees (Attachment E). All field personnel assigned to the project will receive Hazard Communication training prior to the start of this project. A copy of the Hazard Communication Program will be on file at the site. At the project office, ECC will maintain a file of Material Safety Data Sheets (MSDSs) for any site-specific chemical substances.

If a change in the scope of work requires the use of hazardous material, ECC will provide and maintain copies of applicable MSDSs on-site in the MSDS file.

5.3 Respiratory Protection Program

ECC provides a Respiratory Protection Program for its employees (Attachment F). This program includes written procedures, training, medical surveillance, fit testing, maintenance of equipment, and other components. All field personnel assigned to this project that may be exposed to hazardous materials requiring respiratory protection will be covered under this program. All ECC employees will be fit tested and trained in the use and maintenance of Air Purifying Respirators (APR) prior to being issued and using a respirator (Attachment F).

5.4 Radiation Safety Training

ECC provides a Radiation Protection Program for its employees, which was developed in accordance with the principles of As Low As Reasonably Achievable (ALARA). The RPP is too voluminous to include here but will be present on site. This program includes written procedures, training, medical surveillance, fit testing, maintenance of equipment, and other components. All field personnel assigned to this project that may be exposed to radioactive materials requiring respiratory protection will be covered under this program.

6.0 EXPOSURE MONITORING PROGRAM

Based on the chemical and physical hazards anticipated during this project, appropriate exposure monitoring will be conducted to identify and evaluate hazards and guide field decisions related to personnel safety and operations. A baseline assessment will be performed for identified contaminants of concern and this data will be compared to previous site data to determine baseline measurements for site work.

Monitoring will be used in decision-making for the following:

- Selecting PPE (downgrading or upgrading);
- Determining whether dust suppression methods are effective;
- Delineating areas where protection is needed;
- Assessing the potential health effects of exposure; and
- Determining the need for specific medical monitoring.

6.1 Minimum Requirements

All exposure monitoring, including that for non-radioactive metals contaminants will be conducted by the HSO or a qualified designee. The designee will be trained and qualified to operate all instruments, including inspection, calibration check, warm-up and functions check, sampling procedures, maintenance, and storage for each instrument the HPT will use. Specific instrument training will be completed and documented prior to the start of the project.

All portable monitoring instruments will be calibrated according to the manufacturer's instructions daily. A record of this calibration will be maintained by ECC on-site during the project. This daily instrument calibration will be performed by health physics personnel and documented on an Instrument Calibration Log (Attachment G). Records of the daily calibration checks will be maintained on-site during the project.

All exposure monitoring will be documented on an Exposure Monitoring Log (Attachment H). The HSO will initiate a new log for each day of monitoring for each parameter being monitored.

6.2 Project Exposure Monitoring

6.2.1 Occupational Monitoring

Occupational monitoring will be performed for total particulates, radionuclides (Ra-226, Th-232), metals (As, Pb), and silica.

At the onset of the field operations, all personnel in the immediate area of excavation and loading will wear modified level C PPE. Following a period of sample collection and evaluation of laboratory data, the HSO/RSO may alter the PPE criteria.

6.2.1.1 Total Airborne Dust Monitoring

Total particulate monitoring will be measured in the work zone throughout the project. These values will be recorded in the Exposure Monitoring Log (Attachment H). Total airborne dust exposure levels exceeding 2.0 mg/m^3 will require the use of Level C PPE. Dust control measures will be instituted at the commencement of work. During the operations, fine mist water spraying will be used as a dust abatement measure to preclude the spread of dust. If excessive dust levels are perceived in any areas outside the EZ, a MIE mini-ram will be used to calculate airborne dust levels. A MIE mini-ram particulate monitor will be used if airborne dust is observed in significant concentrations.

6.2.1.2 Radionuclide Exposure Monitoring

During operations in radionuclide contaminated areas, a high volume area sampler will be stationed in the work zone. In addition, a lapel sampler will be assigned to the person most likely to have the highest exposure to potentially contaminated dust. These full shift personal samples will be representative of the regular, daily exposure to Th-232, Ra-226, and progeny for the individual. The air sampling filters collected for radiological monitoring will be analyzed on-site for alpha activity each day. The PHP will evaluate the air monitoring data on a daily basis, and initially compare the results against the restrictive DAC for Th-232 (10 CFR 20.1204(f)), and determine the radioisotopic analysis requirements. All initial air samples will be sent off-site for radioisotopic analysis. These analyses will be used to determine if the DAC for Ra-226 is more appropriate for the Site. Isotopic laboratory analyses will be performed when on-site analysis indicates a need to determine the specific radioisotope concentrations. Any recommended changes to the level of PPE protection will be reviewed with the HSO and the PHP.

Prior to shift start up; continuous measurements of radon daughter concentrations will be made using the FemtoTech CRM. The 10 CFR 20 restricted area limit for radon is $9\text{Ex}10^{-9} \text{ } \mu\text{Ci/ml}$. The ECC action level will be 50% of the limit. The action level represents a concentration where specific corrective actions will be triggered to reduce the amount of radon present. An example of a corrective action is the activation of High Efficiency Particulate Air (HEPA) filtered negative air machines and removal of sources. Grab samples for radioactive constituent analyses will be corrected using a calibrated high volume sampler. Samplers will be located in strategic points based on the activities for the day. Ambient air monitoring will be conducted at downwind locations on a daily basis until it has been determined that this frequency is unnecessary based on negative results associated with a specific type of similar activity.

The results of the air-monitoring program will provide a record of compliance with respect to identification of any radioactive airborne concentrations. This data will be used to determine protection factor requirements when radioactive concentration limits approach the DAC for inhalation as listed in 10 CFR 20 Appendix B, Table 1.

6.2.1.3 Non Radioactive Toxic Metals Exposure Monitoring

Although engineering controls will minimize exposure to potentially contaminated particulates, ECC will monitor high-risk personnel for exposure to toxic metal contaminants. The monitoring will be performed to ensure that exposures to these contaminants do not exceed the criteria as identified in Table 3-1. At the onset of the project, monitoring will be performed on a regular basis. These samples will be sent for offsite analysis periodically. Using the initial data, ECC will develop response protocol to adjust the periodicity and intensity of the monitoring to insure compliant and adequate occupational and environmental safety.

Full shift personal air monitoring will be conducted for non-radioactive metals based on the observed elevated concentrations found at Li-Tungsten. These samples will be sent for offsite analysis periodically. The results will guide ECC's actions for upgrading or downgrading engineering controls and PPE assignment.

Real time exposure estimate for metals will be calculated periodically throughout the duration of the Remedial Action. These estimates will be made utilizing dust concentrations as measured by the process described in Section 6.2.2 and XRF readings of the material being excavated. For example:

A work area where As contaminant is measured in-situ at 150 mg/kg and total airborne dust measures 1 mg/m^3 , As exposure to personnel in the immediate area will be estimated at 0.00015 mg/m^3 . Comparing these values to the exposure limits present in Table 3-1, ECC will ensure worker protection is adequate.

The procedure for air sampling for metals will be modeled after the NIOSH Method 7300. Air sampling for metals involves passing a known quantity of air across a mixed cellulose ester filter. The particulate phase of the air, with a nominal size of greater than or equal to 0.8 microns is trapped in the filter. These air-monitoring filters will be sent to an outside laboratory for metals analyses. The method description, complete with a list of typical equipment, equipment setup, and calibration and operation methods is provided in Attachment I.

6.2.1.4 Silica

Monitoring for silica dust (silica crystalline, CAS # 14464-46-1) will include meeting the more stringent ACGIH requirements of 0.05 mg/m^3 . Monitoring will be conducted on-site by an ECC representative. TWA total dust samples will be collected representative of the work area conditions and sent off-site to an approved laboratory for silica and total dust analysis.

6.2.2 Perimeter Monitoring

ECC will use the New York State Generic Community Air Monitoring Plan as guidance for implementation of perimeter monitoring activities. The Plan, dated June 2000, is included as Attachment J. Continuous monitoring will be initiated during site activities.

As described in the Plan, the following two guidelines will be followed:

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (ug/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ ug}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.
2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ ug}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ ug}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

ECC will setup several air-sampling stations around the perimeter of the work site to monitor particulate exposures to the public. At minimum, ECC will maintain 2 stations downwind of the work activities and 1 station upwind. ECC will give particular attention to the northwestern perimeter of the site where proximity to residences public housing is greatest.

At each station a low-volume air pump will be operated for purpose of evaluating radionuclide exposures. Continuous airborne particulate samples will be collected and analyzed on-site monthly for gross-alpha activity. If daily occupational monitoring indicates an exposure problem, ECC will re-evaluate the perimeter sampling frequency. The off-site laboratory will analyze 10% of the composite samples. Gamma exposure will be monitored at the property fence line using TLD badges attached to the environmental monitoring stations. Site walk-around gamma surveys will be conducted weekly or daily, if necessary to provide more frequent measurements as on-site conditions change. Samples will be collected and analyzed for both Ra-226 and Th-232 on a weekly and monthly basis respectively.

Measured activities will be compared to the 10 CFR 20 airborne effluent concentration limit for Ra-226 and Th-232 in unrestricted areas of $9 \times 10^{-13} \text{ } \mu\text{Ci}/\text{ml-air}$ and $6 \times 10^{-14} \text{ } \mu\text{Ci}/\text{ml-air}$ respectively. This results in a dose to a member of the public of 50 mRem/yr. In addition to radioactive particulates, specific air monitoring will be utilized to sample any potential dispersion of excessive fugitive dust, if necessary. If an airborne concentration exceeds the action limit of 20 % of Table 2 of Appendix B to 10 CFR 20, an immediate evaluation of the activities that may produce elevated airborne concentrations will include the following considerations:

- Incorporate additional containment structures; and
- Increase wetting techniques and other engineering controls.

Outdoor radon concentrations will be measured continuously using Alpha Track Etch Cups. Radon detectors will be placed at the environmental monitoring stations and will be read quarterly.

At each station, ECC will setup a personal lapel pump to monitor for As and Pb exposures to the public. Initially, these samples will be collected and analyzed on a weekly basis.

Total airborne dust will be monitored at each station using a MIE mini-ram particulate monitor.

6.3 Ionizing Radiation Exposure Monitoring

The ECC Radiation Protection Program outlines the generic compliance actions necessary to keep occupational doses and public doses to an ALARA level. This section presents procedures and engineering controls that address the site-specific hazards. Through proper implementation of this section all permissible doses, levels and concentrations relating to occupational exposure and environmental monitoring will have a documented record of compliance. The actual limits on permissible doses, levels, and concentrations of radioactive materials are presented in 10 CFR 20. This section describes how ECC will satisfy the permissible doses, levels, and concentration requirements. The ECC Radiation Protection Program is based upon the ALARA principles for monitoring radiation exposures under permissible doses. ECC SOPs under the Radiation Protection Program provide instruction to monitor and prevent exposure to excessive levels and concentrations of radioactive material.

6.3.1 Personnel and Visitor Dosimetry

ECC and subcontractor personnel who regularly enter the controlled area will be required to wear a dosimeter. The RSO will evaluate dosimetry requirements for visitors on a case by case basis. In the event the visitor is likely to receive an annual external whole body dose equivalent of 50 mrem or more in a year, the escort's proportional external exposure for the duration of the visit will be assigned to the visitor.

All other personnel assigned to the project for prolonged periods (i.e. greater than a week) will be assigned a permanent whole body TLD. TLDs will be procured from an NVLAP approved dosimetry vendor who is accredited in the high-energy photon and low energy photon categories. The TLD service will be on a quarterly basis. Results from TLD readouts will be posted in the personnel trailer as they become available. All TLDs will be worn and handled in accordance with ECC SOP-R128, Radiation Dosimetry (Appendix D).

ECC will monitor internal and external radiation exposure for all personnel who may receive a Total Effective Dose Equivalent (TEDE) greater than 100 mrem per year. Dose assessment is accomplished by the use of air monitoring data, external personal dosimetry, and in vivo and in vitro monitoring results. The results of in vivo monitoring that indicate a positive result or a potential uptake will be evaluated and the resulting dose incorporated into the individuals TEDE value. Internal dose assessment will be performed using the methods recommended by ICRP 30 and computer models.

ECC will require complete occupational exposure histories from each individual working in the restricted area. The occupational dose incurred from another employer in the same year will be accounted for in determining the individual's annual dose.

6.3.2 Gamma Surveys

Gamma surveys will be conducted in accordance with ECC SOP-R112 (Appendix D). The SOP specifies the use of a micro-R-meter or equivalent. Measurements will be taken at varying distances; however, a height of 3 feet (waist high) from the floor or ground surface will be the common reference point for survey comparisons. Each survey form has notation points to indicate the point of survey. Sensitivity (i.e. 2x2 NaI detector) may be desired as surveys for free release are conducted. Gamma surveys will be conducted daily for several purposes which include: general screening for general exposure rate surveys for worker protection, discrete surveys for identification of hot spots, and package surveys for Department of Transportation (DOT) requirements.

All instruments used for gamma surveys will be operated in accordance with ECC SOPs associated with Portable Instrument Operating Procedures (Appendix D). All instrument used on-site will be calibrated for the radioisotope of interest Th-232. If the calibration facility does not have a Th-232 standard, an appropriate standards will be selected in accordance with ANSI n323a. Daily checkout procedures and instrument logs will be maintained by the HPTs.

6.3.3 Alpha Surveys

Alpha surveys will be conducted in accordance with ECC SOP-R110, Alpha Radiation Measurement, and SOP-R108, Surface Scanning (Appendix D). Alpha screening surveys are conducted using hand-held alpha scintillation detectors in conjunction with a portable ratemeter or scaler. The purpose of the alpha screening survey is to identify areas with surface contamination. Removable alpha contamination surveys are performed using wipes in accordance with ECC SOP-R119, Determination of Removable Activity (Appendix D). The wipes or smears will be counted in the on-site laboratory using the SCA and ZnS scintillation planchet counter.

Alpha screening surveys are normally conducted to determine if alpha contamination is present or not present. Alpha screening surveys will be conducted on equipment and materials being staged for decontamination. Release surveys or other more accurate quantification surveys are conducted using more precise techniques such as using predetermined counting periods, homogeneous surfaces, and measured surface areas normally organized in a grid format. Release surveys will be conducted on materials that have been decontaminated or on materials that do not exhibit positive readings during the screening survey. Fixed alpha contamination surveys are an example of a type of quantification survey that will be conducted after decontamination activities are complete. The Free Release Survey section of this document will address the survey requirements necessary to meet the free release criteria for removable and fixed alpha surface contamination.

6.3.4 Free Release Survey Methodology

The free release or unrestricted use category applies to materials or surfaces that once contained radioactive contamination and are now ready to be released to the general public without restriction.

The specific steps necessary to demonstrate compliance with each applicable criteria include: proper radiation detection equipment selection, development of a statistically defensible analytical and survey protocol, and verification of proper implementation. The quantities and variations of detector assemblies may change as the project progresses. In terms of statistical justification, the following paragraphs will address what is planned to date. Based on the equipment selected, the following compliance strategy was developed. Instrument efficiencies quoted represent manufacturers' claims for measuring Th-230, because the manufacturer does not have a Th-232 source. Once obtained, instrument daily efficiencies will be determined during the instrument checkout in accordance with SOP-R104 (Appendix D).

The gamma exposure rate criteria can be obtained by selecting an average background reading for the Li-Tungsten work area. A Ratemeter and 2"x 2" NaI(Tl) detector (Ludlum Model 44-10) with increased sensitivity properly calibrated will be the primary instrument.

Alpha surveys will be conducted with an assortment of instruments and detectors based on the physical requirements of the survey. The majority of large flat homogeneous surface area surveys can be conducted with a floor monitor survey meter equipped with a large area (821 cm²) gas proportional floor monitor (Ludlum Model 239-1F). The gas proportional detector has two pi efficiency (40%) for Th-230. Materials having non-homogeneous surfaces may be surveyed with a Ludlum Model 2241-2 Scaler/Ratemeter equipped with a Model 43-90 100 cm² Alpha Scintillator. The 2 pi efficiency of the Model 43-90 is typically 25% for Th-230. In tighter areas, the more slender detectors, such as the Model 43-5, 50 cm² Alpha Scintillator with less sensitivity (20%), will be used.

Removable alpha contamination will be detected through the use of a smear or wipe test (ECC SOP-R119) using a Single Channel Analyzer (Ludlum Model 2929) and an Alpha/Beta Scintillation Planchet counter (Ludlum Model 43-10-1) with an efficiency of 30-35% for Th-230. This system will be used for all smear counting and filter counting for air monitoring activities. The MDA calculations for specified counting periods are prescribed in the ECC SOPs R119 and R118 (Appendix D).

MDA calculations will be conducted to demonstrate that the instrument detection capability is adequate to demonstrate compliance with the unrestricted release criteria. ECC will be performing this type of analyses on a daily basis to ensure the instrumentation is operating properly prior to daily startup.

7.0 SITE CONTROL MEASURES

The following section describe Site control measure including establishing work zones, site security and dust control, controls for external and internal radiation occupation exposure to radiological elements, and medical surveillance of Site employees during this project.

7.1 Site Work Zones

Site work zones with definitive boundaries will be established to prevent or minimize exposure from the project hazards by reducing migration of contaminants into clean areas. ECC will

establish and maintain three work zones at each site (Figure 7-1, Work Zone Layout). Figure 7-1 illustrates the preliminary locations of the work zones. Final placement of the work zones will be based upon the results of the initial site survey. All work zones will be marked with warning signs and caution tape. The three zones will be designated as the Support Zone (SZ), the Contamination Reduction Zone (CRZ), and the Exclusion Zone (EZ).

7.1.1 Support Zone

The SZ is the uncontaminated (clean) area where personnel will not be exposed to hazardous material. Dose rate in unrestricted area will not exceed 0.002 Rem in any one hour (10 CFR 20.1301(2)). Inside the SZ, the following resources will be available: two-way radio communication with workers in other zones, first-aid supplies, fire extinguisher, drinking water, and other appropriate support equipment. The SZ will serve as the main point of contact for visitor check-in and for the initiation of any necessary emergency services.

7.1.2 Contamination Reduction Zone

The CRZ is the area between the contaminated area and the clean area, where equipment and personnel are monitored and decontaminated, if necessary, after leaving the EZ. This zone is designed to prevent contamination of the clean zone. Personnel will remove and/or decontaminate PPE and place it in appropriate containers. Site vehicles and equipment will also be decontaminated in the CRZ. The CRZ will contain personnel and equipment decontamination pads; waste containers for liquids, solids, and PPE; first-aid supplies; an eyewash/emergency shower; and a fire extinguisher.

7.1.3 Exclusion Zone

The EZ includes the work activity area of the Site. The EZ will be clearly marked with flagging, barricade tape, traffic cones, or other indicators to limit access. An access control point will be established. Only authorized, trained, and qualified personnel with the appropriate PPE will be admitted to the EZ. Personnel entering the EZ will use the Buddy System.

7.2 Site Security Control

ECC will be responsible for providing site security at the Li-Tungsten Superfund Site. This will include:

- Maintaining 24-hour security within the site;
- Limiting access to authorized vehicles and personnel;
- Limiting access through the access gate only;
- Maintaining a Security Log and Visitor Log;

- Inspecting the perimeter fencing and warning signs on a daily basis; and
- Posting signs printed in bold large letters on contrasting backgrounds in English, or in the predominant language of workers unable to read English, where appropriate.

7.3 Site Dust Control

Due to the radioactive nature of the dust, dust control is a primary concern. During operations, dust abatement measures, such as water spraying, may be implemented to reduce the spread of dust in the unpaved areas on-site. Dirt on paved areas of the site may be physically removed using a loader and/or hand tools. The area will be surveyed and cleared. The dirt will be placed in the next truck that is loaded.

The effectiveness of the dust control will be evaluated and monitored visually. ECC will follow the NYS Department of Environmental Conservation's Technical and Administrative Guidance Memorandum #4031 for controlling fugitive dusts at inactive hazardous waste sites. Water will be used sparingly to prevent the creation of puddles or run-off. APRs with HEPA cartridges will be worn to reduce or minimize dust inhalation by workers in accordance with the HSCP.

Work activities will be managed to prevent fugitive dust emissions beyond the site boundary. Each site worker and manager will be responsible for ensuring the zero discharge policy. If fugitive dust conditions continue even after water or tarps are applied, work will stop and the following engineering controls may be implemented.

- Reduce swing speed and drop height for excavation equipment;
- Clean haul road and access road areas of dust generating solids;
- Reduce speed of equipment on-site; and
- Shut down until conditions improve.

Implementation of any of these controls will be determined by the PM, who will observe site conditions on a regular basis, obtain local meteorological information on a daily basis, and consult with the Construction Superintendent on soil conditions and moisture content.

7.4 Control of Occupational Exposure to External Radiation Sources

The control of exposure from external sources in restricted areas will be accomplished through prudent application of time, distance, and shielding applications.

Restricted areas will have controlled access; the point of entry and exit will be clearly marked. The restricted areas will be marked off using barricade tape. Worker or visitors that disregard the rules of the designated areas will not be allowed site access.

7.5 Controls to Reduce Internal Occupational Exposure

The respiratory protection and controls to reduce internal exposure in the restricted areas are a primary focus of the ECC Radiation Safety Program. In keeping with the ALARA operating philosophy, ECC will continuously upgrade the radiation controls in a proactive manner to anticipate potential changes in site conditions. Four key areas that will be implemented include: (1) use of process or other engineering controls, (2) use of other controls, (3) use of individual respiratory protection equipment, and (4) use of appropriate surveys and bioassays. Specific examples of each area are provided with following sections.

7.5.1 Process and Engineering Controls

The anticipated process or engineering controls focus on the area of dust suppression. Radioactive and non-radioactive metal contaminants are present in the soil being excavated. Examples of process controls that may be implemented include:

- Wetting techniques;
- Area not currently being excavated will be covered; and
- Wind fences.

Visqueen or other anti-contamination materials may be used to prevent the spread of contamination.

7.5.2 Other Exposure Controls

Examples of other controls include items that relate to system or process controls. For example, ECC will provide site specific training to enable the radiation worker to develop task specific contamination reduction techniques.

7.5.3 Individual Personnel Protection Equipment

Individual respiratory protection equipment will be provided as described in ECC SOP HS-012. The project will be initiated using modified Level C PPE in the restricted areas. Level C would include the use of a full-face respirator equipped with HEPA filter cartridges specifically designed for radioactive dusts. This level of protection will be required for those personnel working in close proximity to the contaminated material within the EZ. The required level of PPE will be evaluated and may be changed as monitoring data is collected. Additional detail on the types of respirators and elements of the Respiratory Protection Program is presented in Attachment F. As described in Section 6.2, the exposure-monitoring program includes the following types of monitoring activities; although the frequency of the monitoring may change as determined by the CHP.

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Based on the results of the daily air monitoring, suitable respiratory protection will be developed or maintained for the next day's planned activities, provided the activities are similar in nature and/or produce similar exposure concentrations. The proposed Level C full-face respirator equipped with the HEPA cartridge has a protection factor of 100 (Re: Appendix A to 10 CFR Part 20, *Protection Factors for Respirators*).

ECC will conduct extensive radiological contamination surveys on a daily basis to support the respiratory protection program. Daily contamination surveys pertaining to internal exposure prevention will consist of fixed and removable alpha surveys (see ECC SOP-R119) in the restricted area and in adjacent locations. Results will be posted daily and covered in the Tailgate Safety Meetings conducted daily. In addition, if an individual shows positive indication of facial contamination from a respirator breakthrough, nasal smears will be taken and counted in accordance with ECC SOPs. If the nasal smears indicate that an uptake has occurred, the individual will be required to submit urine sample for bioassay within the next 24 hours.

The bioassay program for uranium, thorium, and radium includes initial project baselines for all radiation workers. Bioassays will be collected and sent to an off-site laboratory that meets specified analytical capability has proper handling techniques, and rapid turnaround of results. The methods employed should be sufficiently sensitive to permit the measurement of sample activities corresponding to those excreted by individuals containing small fractions of the maximum permissible body burden. The activities of interest may be in the order of 0.1 disintegration per minute in a 24-hour collection for long-lived alpha emitters. As a backup to the bioassay program, whole body external counting may be conducted if it is determined that an uptake has occurred. In addition, breath analysis of exhaled air for radon-222 after inhalation of significant quantities of Ra-226 and Th-232 can be accomplished since approximately 70% of radon is eliminated from the body on average (RE: NCR Report No. 57, p.74).

7.6 Medical Surveillance

In accordance with 29 CFR 1910.120 (f), all personnel working at the site with the potential for exposure to radioactive or hazardous material will have successfully completed a pre-placement or periodic/updated physical examination.

ECC SOP HS-009 describes the company Medical Surveillance Program that is in effect for this project.

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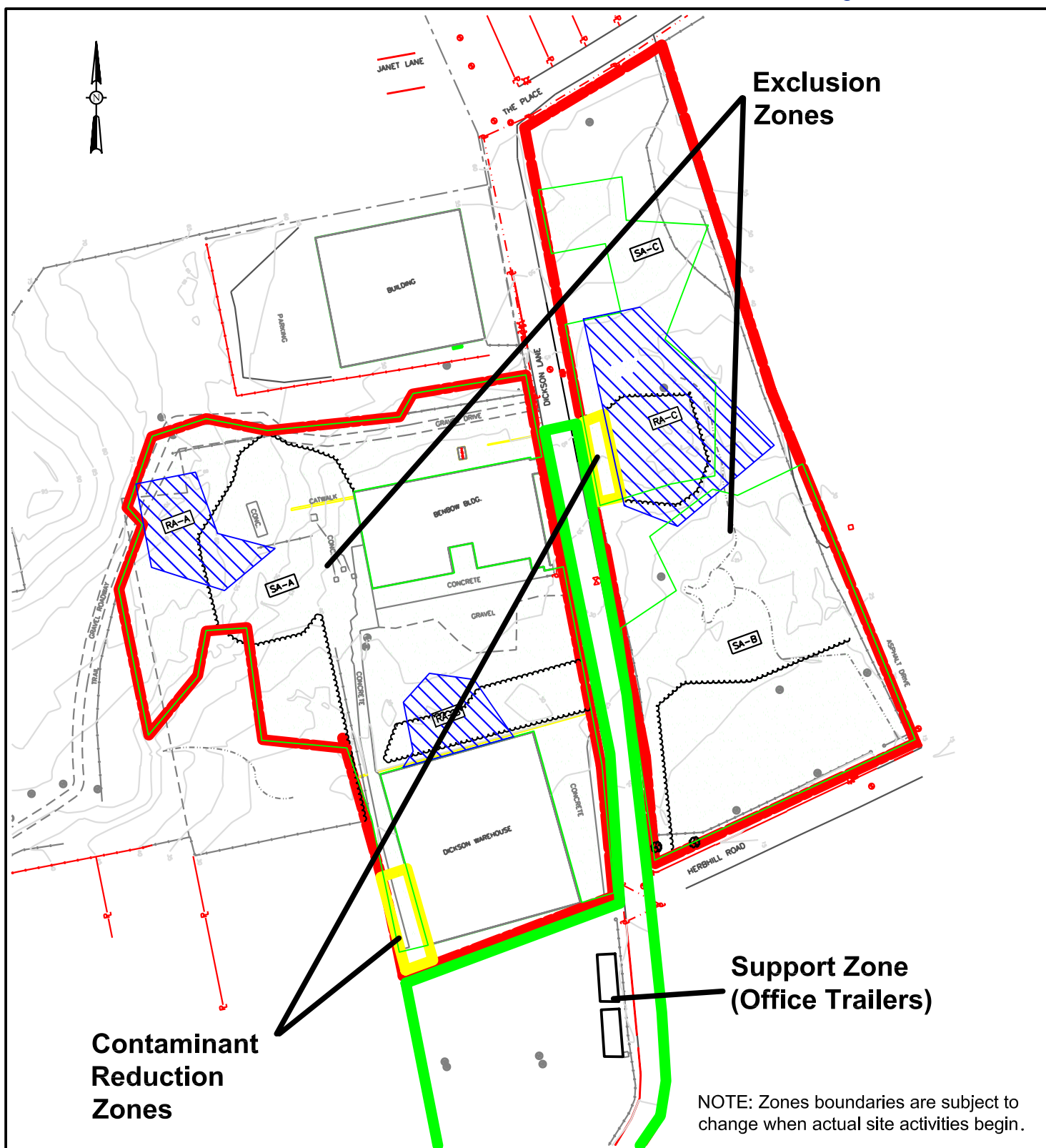
8.0 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

Please see ECC SOP-HS-025, *Emergency Response and Contingency Program*, in Appendix D.

Table 8-1
Emergency Contact List

ORGANIZATION	TELEPHONE NUMBER
Medical Emergency	
Hospital – North Shore University Hospital	(516) 674-7300
Fire	
Glen Cove Fire Department	(516) 922-1226
Police	
	911
Environmental	
NIOSH Technical Information Line	(800) 356-4674
Chemtrec	(800) 424-9300
National Response Center (NRC) - Chemical Spills	(800) 424-8802
Li-Tungsten Project Manager	
Edgard Bertaut	(412) 395-3052
Contracting Officer Representative	
<u>ECC Program Manager, Mr. Marc Mizrahi</u> Office Phone: Cell Phone:	(973) 338-7011 (973)202-8776
<u>ECC Project Manager, Phil O'Dwyer</u> Office Phone: Cell Phone:	(614) 879-6941 (614) 402-2020
<u>ECC Health and Safety Officer and Project Health Physicist, Mr. Ted Johnson</u> Office Phone: Cell No:	(303) 298-7607
<u>ECC Rad-Con Services Director, Mr. Keith Anderson, CHP</u> Office Phone: Cell Phone:	(303) 298-7607 (303) 717-2213
<u>ECC ESQ Manager Mike McSherry, CIH</u> Office Phone: Cell Phone	(215) 776-0108 (215) 776-0108

FIGURES



ENVIRONMENTAL CHEMICAL CORPORATION
1240 BAYSHORE HIGHWAY
BURLINGAME, CA 94010

DRAWN BY:
NW

APPROVED BY:
CC

DATE:
23-JULY-02

SIZE:
A

FIGURE 7-1 WORK ZONE LAYOUT

REMEDIAL ACTION PARCEL B AND UPPER PARCEL C
LI TUNGSTEN SUPERFUND SITE
GLEN COVE, NEW YORK

PROJECT CODE: XX

CONTRACT CODE: XX

SCALE: NTS

FILENAME: FIGURE 3-1.DWG

SHEET: 1 OF 1

REV: -

Attachment A

**Visitor Information Form and
HSPCP Compliance Agreement**

ENVIRONMENTAL CHEMICAL CORPORATION

Visitor Information Form

You are entering a hazardous waste site. Overexposure to the toxic substances here can cause damage to internal organs and, in cases of extreme exposure, death. Heavy equipment operation and other inherently dangerous work is underway. You will remain with your designated escort at all times and follow his/her instructions for your safety and the safety of others. You must also wear all protective clothing and equipment issued. Minimum protective equipment will be Level D protection (hard hat, steel toed boots, and safety glasses). Equipment issued must be returned prior to leaving the site.

VISITORS CERTIFICATION

I acknowledge that I have been advised of the dangers present at this hazardous waste site facility. I agree to immediately follow all direction(s) given by my escort on site. I also certify that I do relieve ECC, the U.S. Government, the applicable state in which the project site is located, their officers, employees, and agents of all liability of all consequences raising from and related to the potential hazards associated with entry to this site.

NAME

SIGNATURE

Attachment B

Field Safety Checklist

ECC FIELD SAFETY CHECKLIST

Work Location:

-
1. Reviewed work plans, SSHP (UST/Excavation Safety Procedures) with Project Manager and QC/Safety Officer.
 2. Requested maps of aboveground and underground utilities.
 3. Reviewed utility maps: (Water supply, firewater, sewer, process sewer, electric, gas, telephone, 1
 4. Met with facilities representative to review utility locations and asked each representative the following questions:
 - a. Any underground utilities at work site location?
 - b. Any on-going construction that would affect field activities?
 - c. Any chemical releases associated with unit operations?
 - d. Any other hazards associated with operating units?
 - e. Any special requirements?

Name of utilities and the signature of the representatives:

5. Determine if any permits are required:
Type:
6. Obtained necessary permits: Yes or No
Permit expiration date:
7. Requested MSDS for any on-site chemical or expected in the subsurface:
8. Client's established protocol, if any:
9. Please list emergency supplies on hand (i.e. Fire extinguisher, eyewash station, first aid kit)

Attachment C

Confined Space Program

ENVIRONMENTAL CHEMICAL CORPORATION**Confined Space Entry Permit**

PERMIT ISSUED BY: _____ NUMBER: _____ DATE _____

This permit is required for entry into all confined spaces according to the company confined space entry program and applicable State and Federal Regulations.

ENVIRONMENTAL HEALTH & SAFETY DEPARTMENT SECTION

ENTRY DATE: _____ STANDBY: _____

WORK AUTHORIZED: _____

WORK LOCATION: _____

PPE _____

REQUIRED: _____

EMERGENCY EQUIP: _____

ENTRY PERSONNEL: _____

ENTRY TIME: _____ EXIT TIME: _____ BREAKS: _____

SUPERVISOR SECTION

HAZARD/CHEMICAL	LIMIT/PEL	TIME	RESULT	TIME	RESULT	TIME
Oxygen	19.5% (min)	_____	_____	_____	_____	_____
Flammable	10% (max)	_____	_____	_____	_____	_____

MONITORING EQUIPMENT TYPE	SERIAL#	DATE CALIBRATED
_____	_____	_____
_____	_____	_____

BEFORE SIGNING THIS PERMIT THE JOB SUPERVISOR SHALL ENSURE THE FOLLOWING:

#	ITEM	YES	NO	N/A
1.	Entry procedure reviewed.	_____	_____	_____
2.	Employee retrieval method implemented	_____	_____	_____
3.	Emergency communication capability available	_____	_____	_____
4.	All personal involved have been trained in confined space entry	_____	_____	_____
5.	Atmosphere has been monitored for hazardous conditions	_____	_____	_____
6.	All safety and personal protective equipment is on hand	_____	_____	_____
7.	All pipes carrying materials to/from the space removed/blanked.	_____	_____	_____
8.	Shut off valves and switches tagged and in off position.	_____	_____	_____
9.	Actions taken to prevent injury due to mechanical movement	_____	_____	_____
10.	All sources of ignition removed.	_____	_____	_____
11.	Continuous ventilation activated.	_____	_____	_____
12.	Access restricted to authorized personnel only.	_____	_____	_____

ALL PRE-ENTRY REQUIREMENTS HAVE BEEN MET.

SUPERVISOR SIGNATURE _____

CONFINED.doc



ENVIRONMENTAL CHEMICAL CORPORATION CONFINED SPACE ENTRY PERMIT

This permit is in accordance with 29 CFR 1910.146. The permit must be posted on the job site.

Location of entry _____ Purpose of entry _____
 Permit issued by _____ Date _____
 Permit Number _____ Time of Entry _____ Time Out _____
 Authorized Entrants _____
 Authorized Attendants _____
 Emergency Contact _____ Telephone # _____

Equipment Required For Entry and Work

Personal Protective Equipment + Respiratory Protection _____
 Atmospheric Testing/Monitoring Equipment _____
 Communication _____
 Rescue Equipment _____
 Other _____

Testing Record

Hazard - Chemical	Acceptable Conditions	Result Time:	Result Time:	Result Time:	Result Time:
Oxygen-min	> 19.5				
Oxygen-max	< 23.5				
Flammability	< 10% LEL				
H ₂ S	< 10 PPM				
CO	< 35 PPM				
Other					

Pre-Entry Checklist

ITEM	YES	NO	N/A
1. Confined space entry procedures reviewed.			
2. Employee retrieval method inspected and implemented.			
3. Emergency communication capability available.			
4. All personnel have been trained in confined space entry.			
5. Atmosphere has been monitored for hazardous conditions.			
6. All safety and personal protective equipment is on hand.			
7. All pipes carrying materials to/from the spaces have been removed/blocked.			
8. Shut off valves/switches have been tagged and are in off position			
9. Actions taken to prevent injury due to mechanical movement			
10. All sources of ignition have been removed.			
11. Continuous ventilation activated.			
12. Access restricted to authorized personnel only.			

Authorization by Entry Supervisor

I certify that all required precautions have been taken and necessary equipment is provided for safe entry and work in this confined space.

Name	Signature	Date/Time
_____	_____	_____
_____	_____	_____
_____	_____	_____

Attachment D

Back Injury Prevention

Environmental Chemical Corporation
Corporate Health & Safety Program
IIPP/General Health & Safety Requirements

Prepared: May '99

BACK INJURY PREVENTION PROGRAM

1.0 Purpose

The purpose of ECC's Back Injury Prevention Program (BIPP) is to identify existing or potential back exposure hazards in the work environment; identify and evaluate risk factors causing the problems; design and implement control (i.e., engineering and administrative) measures; and to monitor/evaluate the effectiveness of the control measures being implemented.

2.0 Back Injuries

The National Institute of Occupational Health (NIOSH) has reported that back disorders account for 27% of all nonfatal injuries and illnesses involving days away from work.

An injured back affects your ability to move your limbs, your hips, your neck, and head. Injuries to the back can be very debilitating, causing a lot of pain/discomfort and time away from work. Severe back disorders/injuries may require physical therapy or even surgery.

2.1 Common Causes of Back Injuries

Some of the common causes of back injuries in the work environment include the following:

- C Heavy lifting
- C Twisting and lifting
- C Bending and over exerting/awkward positions
- C Lifting objects with odd shapes
- C Reaching and lifting
- C Sitting or standing too long in one position
- C Slips due to improper footing

2.2 Things Which May Increase the Risk of Back Injury

- C Poor physical condition
- C Poor posture
- C Extra weight
- C Stress (tense muscles)
- C Overdoing it

2.3 Control Measures to Prevent Back Injuries

- C Work at a reasonable pace (don't rush!)
- C Stretch first before lifting an object
- C Rest your back (take frequent breaks) during long lifting activities
- C When possible, push objects — don't pull

*Environmental Chemical Corporation
Corporate Health & Safety Program
IIPP/General Health & Safety Requirements*

Prepared: May '99

- C Avoid twisting at the waist
- C Get help lifting awkward, heavy objects
- C Use carts and hand trucks
- C Try to work in a safe zone between your shoulders and waist
- C Lift correctly

2.4 Employee Monitoring

It is important to closely monitor workers during heavy lifting or any strenuous back activities. Any weight lifting limitations with the worker should be discussed prior to work activities.

3.0 Correct Lifting and Reaching Procedures

One of the basic ergonomic principles when attempting to lift objects is to minimize the moments (force) on the spine. The following are “correct lifting and reaching procedures” which should be implemented by employees:

- C Don't bend over an object you are lifting. Bend your knees, squatting in front of the object to reach it.
- C Lift the object slowly and carefully, using your leg and arm muscles to lift, not pulling with your back.
- C Keep your head up and look straight ahead while making the lift
- C While lifting, keep the object as close to your body as possible
- C Keep abdominal muscles tight while making the lift
- C Use the same techniques when you put the object down
- C If the object is too big or too heavy to lift using these techniques, use mechanical assistance or get someone else to help.

When reaching for objects:

- C Do not reach for an object unless you're strong enough to lift it
- C Use a step ladder to reach objects above the shoulder height
- C Avoid awkward stretches while reaching. This can stress your back and cause you to lose your balance

4.0 Employee Protective Equipment (Back Support Belts)

There is some controversy about the use of back support belts in order to control low back injuries to workers who don't have an existing injury. According to the report by the National Safety Council (NSC), available scientific data does not completely support nor condemn the use of back belts to control low back injuries. One thing that is agreed upon is that back support belts should NEVER be a substitute for a comprehensive Back Injury Prevention Program. Many companies have developed their own “back belt policy”.

The following guidelines shall apply to ECC employees who use back support belts (company or personally owned) during work operations at ECC project/office sites.

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Corporate Health & Safety Program
IIPP/General Health & Safety Requirements*

Prepared: May '99

ECC BACK SUPPORT BELT POLICY

- C Proper training of the back support belt shall be conducted by the Project Manager or Safety Officer to the employee(s) prior to work activities
- C Inspection of the back support belt shall be conducted by the employee before each use. Any defects in the belt shall be reported to the PM or Safety Officer
- C Back support belts shall be correctly worn by the employee at all times
- C The back support belt shall not be used for any other purpose (i.e., harness) except for its intended use.

When wearing a back support belt, please be aware that you may experience a false sense of security by wearing the belt. There is a temptation to lift loads one wouldn't otherwise lift. Please remember, the belt does NOT provide additional strength — it only supports the back.

Attachment E

Hazard Communication Program

ENVIRONMENTAL CHEMICAL CORPORATION

Hazard Communication Program

The purpose of the Hazard Communication Program is to inform and train Environmental Chemical Corporation (ECC) employees about the potential hazards of the materials they may be exposed to while performing their duties. ECC will provide information about chemical hazards and their control through labeling, chemical inventory, Material Safety Data Sheets (MSDS), and training programs as detailed in this written hazard communication program. This program applies to all known hazardous substances in the workplace that employees may be exposed to under normal conditions of use or in a foreseeable emergency resulting from workplace operations. Emergencies include equipment failure and rupture of containers.

This program does not apply to:

- Ⓒ Hazardous waste (as defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976);
- Ⓒ Tobacco and tobacco products;
- Ⓒ Wood and wood products;
- Ⓒ Foods, drugs, or cosmetics intended for personal consumption by employees while in the work place; and
- Ⓒ Consumer products packaged for distribution to and use by the general public, provided that employee exposure to the product is not significantly greater than the consumer exposure occurring during the principle consumer use of the product.

This program is in compliance with Title 29 of the Code of Federal Regulations (CFR) Part 1910.1200 titled Hazard Communication. This written program will be readily available at all ECC offices and project sites.

HAZARD DETERMINATION

Manufacturers, distributors, and importers of chemicals are required to assess the physical and health hazards associated with each chemical they manufacture or import. This information must be conveyed to the employer by means of Material Safety Data Sheets and container labels. Hazardous substances are any material listed in any one or more of the following lists:

- Ⓒ 29 CFR Part 1910, Subpart Z, Toxic & Hazardous Substances (OSHA);
- Ⓒ Threshold Limit Values (American Conference of Governmental Industrial Hygienists);

- C National Toxicology Program (NTP);
- C International Agency for Research on Cancer (IARC);
- C Any scientific study providing evidence that a material has physical or health hazards;
- C Mixtures containing 1% or more of a hazardous substance; or
- C Mixtures containing 0.1% or more of a carcinogen.

Consumer products used under normal conditions are exempt from federal hazard communication regulation.

MATERIAL SAFETY DATA SHEETS (MSDS)

Manufacturers and importers of chemicals are required to develop an MSDS for each chemical based upon the information they obtained during the hazard determination process. A copy of the MSDS supplied by the manufacturer or distributor of the chemical shall be kept at each ECC project site and office. The Corporate Health & Safety Specialist, Chemical Hygiene Officer (Cincinnati Lab), or Project Safety Officers will be responsible for obtaining an MSDS for all chemicals present at each site or office. These individuals shall review incoming MSDSs for new and important health and safety information. All supervisors and employees will be informed of the new MSDS within 30 days of the Health & Safety Officer receiving the new MSDS from the manufacturer.

All MSDSs will be reviewed for completeness by the ECC Safety Officer. If an MSDS is missing, a new MSDS shall be requested in writing from the manufacturer within 7 days.

The MSDS must contain the following information:

- C Chemical identity;
- C Chemical ingredients;
- C Physical and chemical characteristics;
- C Fire and explosion hazard data;
- C Reactivity hazard data;
- C Health hazard data;
- C Control and protective measures;
- C Precautions for safe handling; and
- C Special hazards.

Upon receiving the MSDS from the first shipment of a chemical, the original will be sent to the Health & Safety Officer. The MSDS will be reviewed by the Health & Safety Officer and will be placed in the MSDS binder. ECC will not accept chemicals from the manufacturer or distributor unless a copy of the MSDS has already been obtained from a previous shipment or the shipment is accompanied by an MSDS. MSDSs will be available to all employees and contractors in the work area for review during each work shift.

LABELING

ECC will not accept or release hazardous chemicals for use unless the original container is clearly labeled with the following information:

- C Identity of the hazardous chemical(s);
- C Appropriate hazard warning statement; and
- C Name and address of the manufacturer.

If the hazardous substance is transferred to a secondary container, the secondary container must be clearly labeled with the following information:

- C Identity of the hazardous chemical; and
- C Appropriate hazard warning statement.

All labels must be legible, in English, and prominently displayed on the container. Labels shall not be defaced or removed unless the container is immediately marked with the required information. Unlabeled chemical containers should be immediately reported to the area supervisor or the Health and Safety Officer. The name of the material that appears on the manufacturer's label shall be the same as the name that appears in the area chemical inventory as well as on the MSDS. Regulation 29 CFR 1910.1200 does not require labeling of pesticides, distilled spirits (beverage alcohols) for non-industrial use, or any consumer product.

EMPLOYEE TRAINING

Employees shall be trained on the hazardous substances in their work area:

- C At the time of their initial assignment;
- C Whenever a new hazard is introduced into their area; and
- C Within 30 days of the employer receiving an updated MSDS containing new information indicating significantly increased risk or changes in the use of personal protective equipment.

ECC employees will be trained in the following:

- C Overview of the Hazard Communication regulation (29 CFR 1910.1200)
- C Operations involving hazardous chemicals in their work area;
- C Location and availability of the MSDS and written Hazard Communication Program;
- C How to read an MSDS and container labels;
- C Physical and health effects of hazardous chemicals and measures to be taken by employees to protect themselves;

- C Emergency and first aid procedures to follow in case of exposure to hazardous chemicals; and
- C Use of engineering controls, personal protective equipment, and work practices to prevent or lessen exposure to hazardous chemicals.

The employees shall be informed of their rights to:

- C Personally receive information on the hazardous substances to which they may be exposed;
- C Have their physician receive information regarding hazardous substances to which they may be exposed; and
- C Incur no disciplinary action, including discharge or discrimination, against the employee due to the employee's exercise of the rights given under 29 CFR 1910.1200 and this written hazard communication program.

CHEMICAL INVENTORY

Each ECC office and project site containing hazardous chemicals will have a Chemical Inventory list. The inventory shall be placed with the MSDS binder in a conspicuous location. An MSDS shall be available for each chemical listed in the inventory. The Health & Safety Officer will be responsible for updating the chemical inventory list whenever a new chemical is introduced into the area or a chemical is deleted from the area.

*Environmental Chemical Corporation
SOP HS-007 Hazard Communication Program
Revised: December 2000*

SOP HS-007 HAZARD COMMUNICATION PROGRAM

1.0 POLICY

This program is prepared in accordance with Title 29 of the Code of Federal Regulations (CFR) Part 1910.1200 titled Hazard Communication “*Right to Know*”. This written program will be readily available at all ECC offices and project sites.

2.0 OBJECTIVE

The objective of this Standard Operating Procedure (SOP) is to inform and train Environmental Chemical Corporation (ECC) employees on the potential hazards of the materials that they may be exposed to while performing their work duties. ECC will communicate the “Hazard Communication Program” to their employees and provide information about chemical hazards and controls through labeling, chemical inventory, Material Safety Data Sheets (MSDS), and training programs as detailed in this written hazard communication program. This program applies to all known hazardous substances in the workplace that employees may be exposed to under normal conditions of use or in a foreseeable emergency resulting from workplace operations. Emergencies may include equipment failure or rupture of containers.

This program does not apply to:

- C Hazardous Waste (as defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976);
- C Tobacco and tobacco products;
- C Wood and wood products;
- C Foods, drugs, or cosmetics intended for personal consumption by employees while in the work place;
- C Consumer products packaged for distribution to and use by, the general public, provided that employee exposure to the product is not significantly greater than the consumer exposure occurring during the principal consumer use of the product.

3.0 DEFINITIONS

Chemical - Means any element, chemical compound or mixture of elements and/or compounds.

Chemical manufacturer - Means an employer with a workplace where chemical(s) are produced for use or distribution.

Container - Means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For the purposes of this

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SOP HS-007 Hazard Communication Program
Revised: December 2000*

section, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

Distributor - Means a business, other than a chemical manufacturer or importer, that supplies hazardous chemicals to other distributors or to employers.

Employee - Means a worker who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies. Workers such as office workers and bank tellers who encounter hazardous chemicals only in non-routine, isolated instances are not covered.

Exposure or exposed - Means that an employee is subjected in the course of employment to a chemical that is a physical or health hazard, and includes potential exposure.

Flammable - Means a chemical that falls into one of the following categories: aerosol flammable, gas flammable, liquid flammable or solid flammable.

Hazardous chemical - Means any chemical that is a physical hazard or a health hazard.

Label - Means any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.

Material Safety Data Sheet (MSDS) - Means written or printed material concerning a hazardous chemical that is prepared in accordance with paragraph (g) of 1910.1200.

Mixture - Means any combination of two or more chemicals if the combination is not, in whole or in part, the result of a chemical reaction.

Physical hazard - Means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

Water-reactive - Means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

Work Area - Means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

Workplace - Means an establishment, job site, or project, at one geographical location containing one or more work areas.

4.0 HAZARD DETERMINATION

Manufacturers, distributors and importers of chemicals are required to assess the physical and health hazards associated with each chemical they manufacture or import. This information must be conveyed to the employer by means of Material Safety Data Sheets

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(MSDS) and container labels. Hazardous substances are any materials listed in any one or more of the following lists:

- C 29 CFR Part 1910, Subpart Z, Toxic & Hazardous Substances (OSHA);
- C Threshold Limit Values (American Conference of Gov. Industrial Hygienists);
- C National Toxicology Program (NTP);
- C International Agency for Research on Cancer (IARC);
- C Any scientific study providing evidence that a material has physical or health hazards;
- C Mixture containing 1% or more of a hazardous substance; or
- C Mixtures containing 0.1% or more of a carcinogen.

Consumer products used under normal conditions are exempt from federal hazard communication regulation.

No chemicals shall be used in the work place without reading the MSDS for safety measures regarding ventilation and/or use of respirators, and proper exposure monitoring. Chemicals are not to be stored except in secured ventilated rooms designed for such purposes. Unused portions of chemical bottles are to be placed in the storage room after use.

5.0 MATERIAL SAFETY DATA SHEETS (MSDS)

Manufacturers and importers of chemicals are required to develop an MSDS for each chemical based upon the information they obtained during the hazard determination process. A copy of the MSDS supplied by the manufacturer or distributor of the chemical shall be kept at each ECC project site and office. The Corporate Health & Safety Manager, Chemical Hygiene Officer (Cincinnati Lab) or Project SSHO will be responsible for obtaining an MSDS for all chemicals present at each site or office. These individuals shall review incoming MSDSs for new and important health and safety information. All supervisors and employees will be informed of the new MSDSs within 30 days of the Health & Safety Officer receiving the new MSDS from the manufacturer.

The ECC SSHO will review all MSDSs for completeness. If an MSDS is missing, a new MSDS shall be requested in writing from the manufacturer within 7 days. The MSDS must contain the following information: *chemical identity; chemical ingredients; physical and chemical characteristics; fire and explosion hazard data; reactivity hazard data; health hazard data; control and protective measures; precautions for safe handling and special hazards.*

Upon receiving the MSDS from the first shipment of a chemical, the original will be sent to the SSHO. The MSDS will be reviewed by the SSHO and will be placed in the MSDS binder. ECC will not accept chemicals from the manufacturer or distributor unless a copy of the MSDS has already been obtained from a previous shipment or the shipment is accompanied by an MSDS. MSDS are available to all employees and contractors in the

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Revised: December 2000*

work area for review during each work shift. MSDSs shall be kept in a conspicuous location (ECC job trailer) at all times.

6.0 LABELING

ECC will not accept or release hazardous chemicals for use unless the original container is clearly labeled with at least the following information: identity of the hazardous chemical(s); appropriate hazard warning statement; and name and address of the manufacturer. If the hazardous substance is transferred to a secondary container, the secondary container must be clearly labeled with at least the following information: identity of the hazardous chemical and the appropriate hazard warning statement.

All labels must be legible, in English, and prominently displayed on the container. Labels shall not be defaced or removed unless the container is immediately marked with the required information. Unlabeled chemical containers should be immediately reported to the area supervisor or the Health and Safety Officer. The name of the material that appears on the manufacturer's label shall be the same as the name that appears in the area chemical inventory as well as the MSDS. Neither this program nor 29 CFR 1910.1200 require labeling of the following substances: pesticides; distilled spirits (beverage alcohol) for non-industrial use; and any consumer product.

7.0 EMPLOYEE TRAINING

Employees shall be trained on the hazardous substances in their work area: at the time of their initial assignment; whenever a new hazard is introduced into their area; and within 30 days of the employer receiving an updated MSDS containing new information indicating significant increased risk or changes in the use of personal protective equipment.

ECC employees will be trained in the following:

- C Overview of the Hazard Communication regulation (29 CFR 1910.1200);
- C Operations involving hazardous chemicals in there work area;
- C Location and availability of the MSDS and written hazard communication program;
- C How to read an MSDS and container labels;
- C Physical and health effects of hazardous chemicals and measures to be taken by the employee to protect themselves;
- C Use of engineering controls, personal protective equipment and work practices to prevent or lessen exposure to hazardous chemicals;
- C Emergency and first aid procedures to follow in case of exposure to hazardous chemicals.

The employees shall be informed of their rights to:

*Environmental Chemical Corporation
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- C Personally receive information on the hazardous substances to which they may be exposed;
- C Have their physician receive information regarding hazardous substances to which they may be exposed; and
- C Incur no disciplinary action, including discharge or discrimination, against the employee due to the employee's exercise of the rights given to them under 29 CFR 1910.1200 and this written hazard communication program.

8.0 CHEMICAL INVENTORY

Each ECC office and project site containing hazardous chemicals must have a Chemical Inventory list. The inventory shall be placed with the MSDS binder in a conspicuous location at all times. An MSDS shall be available for each chemical listed in the inventory. The SSHO is responsible for updating the chemical inventory list whenever a new chemical is introduced into the area or a chemical is deleted from the area.

9.0 TRADE SECRETS

ECC recognizes trade secrets may be withheld from disclosure under 29 CFR 1910.1200 (i). At this time, however, ECC is not aware of any chemicals in our inventory for which there is not full and open disclosure of hazard communication.

Attachment F

Respiratory Protection Program

Respiratory Protection Program

Environmental Chemical Corporation maintains a Respiratory Protection Program for its employees. This program includes written procedures, training, medical surveillance, fit testing, maintenance of equipment and other components. All Environmental Division personnel shall be covered under this program. ECC's Respiratory Protection Program is in compliance with 29 CFR 1910.139, ANSI Z88.2-1992, and ANSI Z88.6.

Selection and Use of Respiratory Protective Equipment

There are two general categories of respiratory protective devices; air purifying and supplied-air respirators.

Air Purifying Respirators Selection

Respiratory protection (Level C) shall be worn when engineering controls or administrative controls cannot be successfully implemented in order to control a contaminant which has exceeded its 8-Hour Permissible Exposure Limit (PEL) under OSHA guidelines. Respiratory protection shall include the use of NIOSH approved half face or full-face air purifying respirators equipped with the required cartridges.

APR Limitations

The following limitations apply to the use of APR:

- The odor threshold must be lower than the contaminants exposure limit (TLV/PEL);
- APRs cannot be worn in oxygen deficient atmospheres (less than 19.5% oxygen);
- APRs cannot be worn in areas where the contaminant has reached IDLH (Immediately Dangerous to Life and Health) conditions.

Protection Factor

APR respirators provide different protection factors. Half face respirators have a protection factor of 10X and full-face respirators have a protection factor of 50X.

Example: Maximum Protection = Protection Factor x TLV/PEL

Cartridge Color Codes

The following are the descriptions of cartridge color codes:

<u>Contaminant</u>	<u>Color</u>
Acid gases	White
Organic vapor	Black
Acid gas & organic vapors	Yellow

Radioactive particulates, asbestos,	Purple
dusts, fumes, mists	
Ammonia Gas	Green
Chlorine Gas	White with Orange Stripe

Donning Procedures

The following procedures shall apply when donning a respirator:

1. Make sure you have the following:

- Right type, size and brand of APR;
- Correct cartridge that has not expired;
- APR properly sanitized and stored.

2. Inspect the APR by completing the following:

- Check the cartridge seal;
- Check the straps;
- Check the face piece for cracks and deformity;
- Check the exhalation and inhalation valves.

3. Put on the APR chin first and tighten the straps

4. Fit check the seal by completing the following:

- Positive fit check - Cover exhalation valve and blow out. Mask should inflate on the face without any leaks occurring;
- Negative fit check - Cover the inhalation valves and inhale. Mask should deflate inwards towards the face.

5. Replace cartridge when the following occurs:

- Breathing becomes difficult;
- Chemicals can be smelled or tasted;
- More often (every shift) as recommended.

Sanitation Procedures

- The employer shall provide means for cleaning all respiratory protective equipment;
- Routinely used respiratory protective equipment;
- Emergency respiratory protective equipment shall be sanitized after each use;
- Respiratory protective equipment will be freshened up before each use or transfer to others by using a alcohol free wipe pad.

Full Sanitation Procedures

Full sanitation procedures are listed as follows:

- Take the respirator cartridges or hose off;
- Fill container with lukewarm water;
- Add diluted chlorine bleach;
- Wash the respirator in the solution and then soak for 5 minutes;
- Rinse the respirator with cold water;
- Place on a towel and allow to air dry.

If the respirator is used daily, full sanitation is usually done weekly.

If the respirator is used weekly, full sanitation is usually done monthly.

If the respirator is used monthly, full sanitation is done quarterly.

Storage

When not in use, respiratory protective equipment shall be stored in a zip lock bag or carrying cases to protect it against:

- Dust or damaging chemicals;
- Sunlight or extreme temperatures;
- Excessive moisture.

Environmental conditions in the work area shall be monitored on a regular basis to detect:

- Increases in exposure concentrations;
- Introduction of other hazardous substances.

Each respirator shall be individually assigned and not interchanged among employees without first cleaning and disinfecting.

Respirator Fit-testing

Each employee will be either quantitatively or qualitatively fit-tested annually as a minimum with the respirator(s) they are issued to ensure proper protection. Fit testing shall be performed using irritant smoke tubes, in accordance with ANSI Z88.2 (1992), 29 CFR 1926.1127 and 29 CFR 1910.139. Isoamyl acetate ampules will not be used, except as a preliminary test prior to testing with irritant smoke tubes. Proof of respirator fit testing and training shall be maintained on-site during all work activities. On-site personnel unable to pass a respirator fit test shall not be permitted to enter or work in the Exclusion Zone or Contaminated Reduction Zone.

Attachment G

Instrument Calibration Log

ENVIRONMENTAL CHEMICAL CORPORATION

Instrument Calibration Check Log

Instrument _____ Manufacturer _____ Serial No. _____
Project _____ Job No. _____ Safety Officer _____

[illegible]

Attachment H

Exposure Monitoring Log

ENVIRONMENTAL CHEMICAL CORPORATION

Exposure Monitoring Log

Type of Monitoring_____ **Project**_____ **Date**_____

Instrument_____ **Manufacturer**_____ **Serial No.**_____

TIME	PERSON/LOCATION	RESULT	COMMENTS	SAMPLED BY

MONITOR.doc

Note: Include type of work and weather conditions in Comments column.

Attachment I

NIOSH Method 7300



AIR SAMPLING FOR METALS [NIOSH Method 7300, Elements]

SOP#: 2119
DATE: 10/07/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to define the proper sample collection technique for air sampling for elements (metals), as well as delineate the typical working range of the method and indicate potential interferences. Elements covered by this method include the metals listed in Table 1 (Appendix A).

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Air sampling for elements (metals) involves passing a known quantity of air across a mixed cellulose ester (MCE) filter. The particulate phase of the air, with a nominal size of greater than or equal to 0.8 microns (μm), is trapped in the filter.

This method requires air sampling utilizing 37 millimeter (mm), 3-stage cassettes loaded with 0.8 μm MCE filters and support pads. The approximate minimum and maximum sample volumes required for detection of the metals of interest are listed in Table 1 (Appendix A).

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

No preservatives or special storage conditions are required. However, the samples should be stored with

the filter upright and transported at or near ambient conditions to prevent significant deterioration of the samples. When transporting and handling the samples, prevent impact and vibrations which would dislodge particulates from the filters.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

A potential problem with the sampling method is over-loading of the filter. This can disrupt flow, consequently producing falsely low analytical results. Periodic checking of the filter and pump can predict this condition and sample cassettes can be changed during the sampling period. The multiple filters would be analyzed as one sample with the total volume indicated on the Chain of Custody record.

5.0 EQUIPMENT/APPARATUS

The following equipment is required for air sampling for elements:

- C Low or medium volume air pumps
- C Tygon tubing
- C 0.8 μm MCE filters with support pads
- C 37 mm 3-stage cassettes
- C Hose-barb filter adapters
- C Air flow calibration standard (calibrated rotameter or bubble meter)
- C Screw driver set
- C Air Sampling Worksheets and sample labels
- C Chain of Custody records
- C Particulate monitoring equipment (RAM)
- C Protective clothing
- C Whirl bags

6.0 REAGENTS

This section is not applicable to this SOP.

7.0 PROCEDURE

7.1 Preparation

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.
2. Obtain and organize the necessary sampling and monitoring equipment.
3. Decontaminate or pre-clean equipment, and ensure that it is in working order. Precalibrate sampling equipment, if possible.
4. Prepare scheduling and coordinate with staff, client, and regulatory agency, if appropriate.
5. Perform a general site survey prior to site entry in accordance with the site-specific Health and Safety Plan.
6. Use stakes, flagging tape, or other appropriate means to mark all sampling locations. If necessary, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.
7. Make an estimate of the airborne concentrations of the elements of concern. It may be possible to extrapolate the concentration of particulates by assuming similar percentages of metals are present in the airborne particulates as in the soils. However, it should be noted that this is only a rough estimate. If estimation of the airborne concentration of metals is not possible, then sample volumes should remain within the limits recommended in Table 1 (Appendix A).
8. Arrange for sample analysis by an appropriately certified laboratory and check with the laboratory for any special requirements (e.g., additional lot blanks).

7.2 Calibration

Calibrate the required number of sampling pumps in the following manner:

1. Assemble the calibration train as shown in

Figure 1 (Appendix A) using a representative 37 mm, 3-stage filter cassette loaded with a 0.8 μ m MCE filter and support pad (outlet plug removed), tygon tubing, a hose-barb filter adapter, a rotameter, and an air sampling pump. Depending on the required flow rate, a low volume or a medium volume sampling pump may be required. Refer to Figure 2 (Appendix A) for an illustration of the components of the filter cassette.

2. Turn on the pump and adjust the flow using the flow adjust mechanism until the float ball on the rotameter is aligned with the rotameter's precalibrated flow rate value. A sticker on the rotameter should indicate this value.
3. Affix a sticker to the pump indicating flow rate and media.

7.3 Sampling

1. Assemble the sampling trains with clean filter cassettes (Figures 3 and 4, Appendix A).
2. Verify the pump calibration by removing the inlet plug from the cassette, attaching a rotameter with Tygon tubing and turning on the sampling pump. Ensure that all connections are tight. Record the actual flow rate on the Air Sampling Worksheet. Replace the inlet plug until ready to sample.
3. Set the sampling pump timer (low volume pumps) for the appropriate sampling time as determined by the Work Assignment Manager, or record the elapsed timer readings (medium volume pumps) on the Air Sampling Worksheet. This will be dictated by the type of sampling pump being utilized.
4. Deploy the sampling pumps as indicated in the sampling plan, following site health and safety procedures.
5. Remove the cassette cap or inlet plug from the cassette. Sampling for elements can be conducted with the cassettes open-faced (cassette cap removed) or closed-faced (only inlet port plug removed). Open-faced is preferred because it permits an even loading of the filter cassette and should be used

whenever high particulate concentrations are expected. This allows greater particulate loading of the filter. However, either method is acceptable since the entire filter is used during sample analysis. Closed-faced sampling is typically performed when there is a possibility that the sample may be shaken and particulates may be lost.

6. Turn on the sampling pump and allow it to run for the sampling period determined by the Work Assignment Manager.

7.4 Post Sampling

1. Verify the sampling period by reading the sample run time (low volume pumps) or by checking the elapsed time on the counter (medium volume pumps). Record the sampling time on the Air Sampling Worksheet and turn off the pump.
2. Verify the pump calibration by attaching a rotameter with Tygon tubing and turning on the sampling pump. Record the actual flow rate on the Air Sampling Worksheet. Insert the inlet plug.
3. Remove the sampling cassette from the sampling train and insert the outlet plug.
4. Complete the Air Sampling Worksheet and calculate the sample volume.
5. Label the sample and place it in a whirl bag for transport to the laboratory for analysis.
6. Prepare the samples (including QC samples) for transport by packing them in a shipping container with bubble wrap or styrofoam pieces. Complete a Chain of Custody record in accordance with applicable Chain of Custody Procedures.

8.0 CALCULATIONS

The total volume of a sample is calculated by multiplying the total sample time by the flow rate. The total volume for each sample must be indicated on the Chain of Custody Record.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

The following general QA procedures apply:

1. All data must be documented on Air Sampling Worksheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation and they must be documented.

The following specific QC activities apply:

1. Provide one field blank per sampling event or per 20 samples, whichever is greater. The field blank should be handled in the same manner as the sampling cassette (remove/replace cap and plug, and transport) except that no air is drawn through it.
2. Collect one collocated sample per sampling event or per 10 samples, whichever is greater. Collocated samples are two samples collected adjacent to each other during the same time period at the same flow rates.
3. Include a minimum of two lot blanks per manufacturer's lot of sampling cassettes utilized per sampling event. Consult with the analytical laboratory to determine if additional lot blanks are required.

10.0 DATA VALIDATION

Results of the QA/QC samples will be evaluated for contamination. This information will be utilized to qualify the environmental sample results accordingly with the project's data quality objectives.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA, or corporate health and safety procedures.

12.0 REFERENCES

⁽¹⁾NIOSH Manual of Analytical Methods, NIOSH Method 7300, Elements (ICP) (Issued 02/15/84).

APPENDIX A

Table

TABLE 1. Metal Concentrations are Anticipated to be at or Near the Threshold Limit Value (TLV)

Element (Symbol)	Minimum Air Volume to be collected - Liters	Maximum Air Volume to be collected - Liters
Silver (Ag)	250	2000
Aluminum (Al)	5 ⁽¹⁾	100 ⁽¹⁾
Arsenic (As)	5	2000
Beryllium (Be)	1250	2000
Calcium (Ca)	5	200
Cadmium (Cd)	13	2000
Cobalt (Co)	25	2000
Chromium (Cr)	5	1000
Copper (Cu)	5	1000
Iron (Fe)	5	100
Lithium (Li)	100	2000
Magnesium (Mg)	5	67
Manganese (Mn)	5	200
Molybdenum (Mo)	5	67
Sodium (Na)	13	2000
Nickel (Ni)	5	1000
Phosphorus (P)	25 ⁽¹⁾	2000 ⁽¹⁾
Lead (Pb)	50	2000
Platinum (Pt)	1250	2000
Selenium (Se)	13	2000
Tin (Sn)	5	500
Tellurium (Te)	25	2000
Titanium (Ti)	5	100
Thallium (Tl)	25	2000
Vanadium (V)	5	2000
Tungsten (W)	5 ⁽¹⁾	200 ⁽¹⁾
Yttrium (Y)	5	1000
Zinc (Zn)	5	200
Zirconium (Zr)	5	200

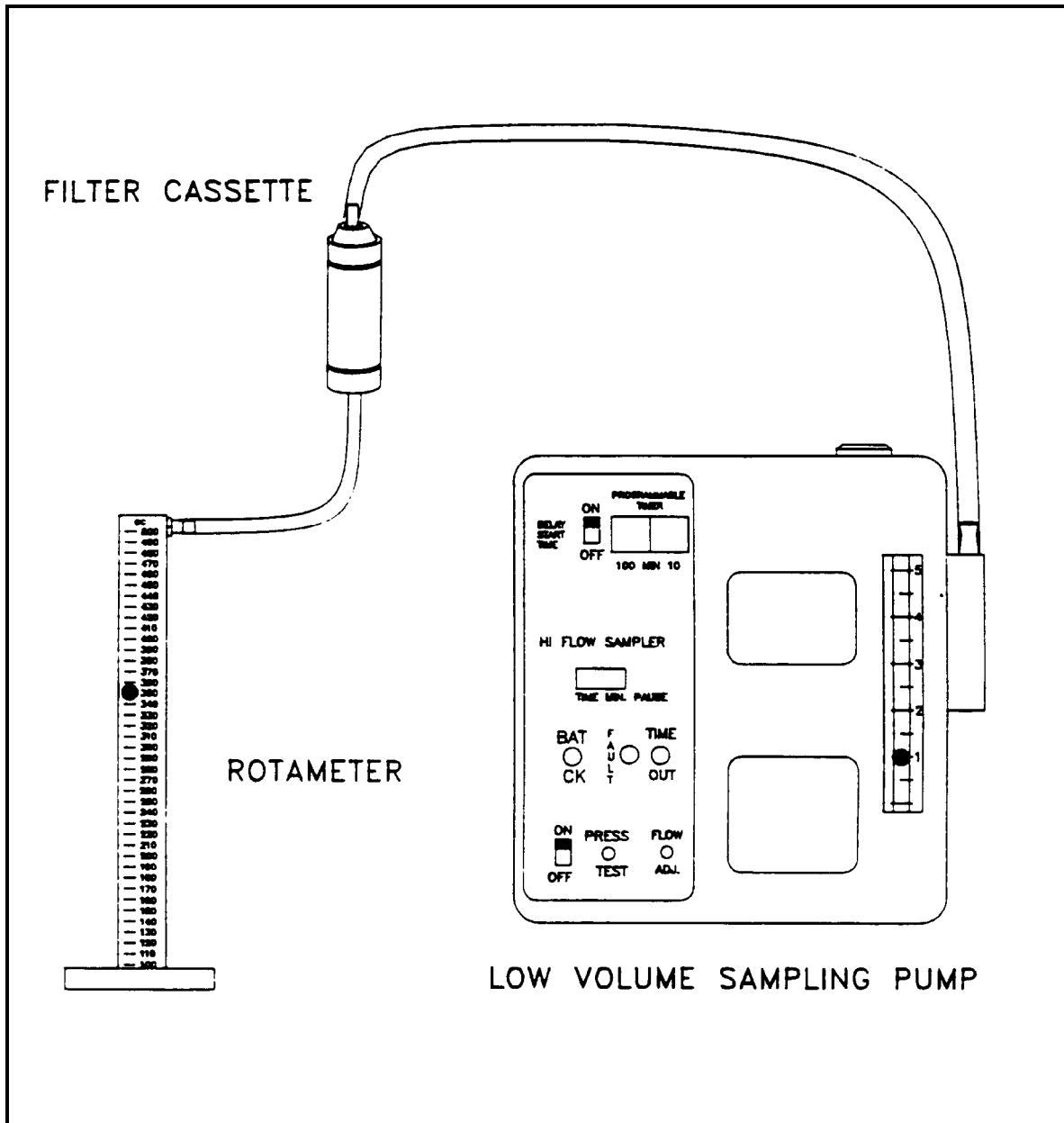
NOTE: Do not exceed a filter loading of approximately 2mg total dust.

⁽¹⁾ Greater volumes may be required if the anticipated concentration is less than the ACGIH TLV.

APPENDIX B

Figures

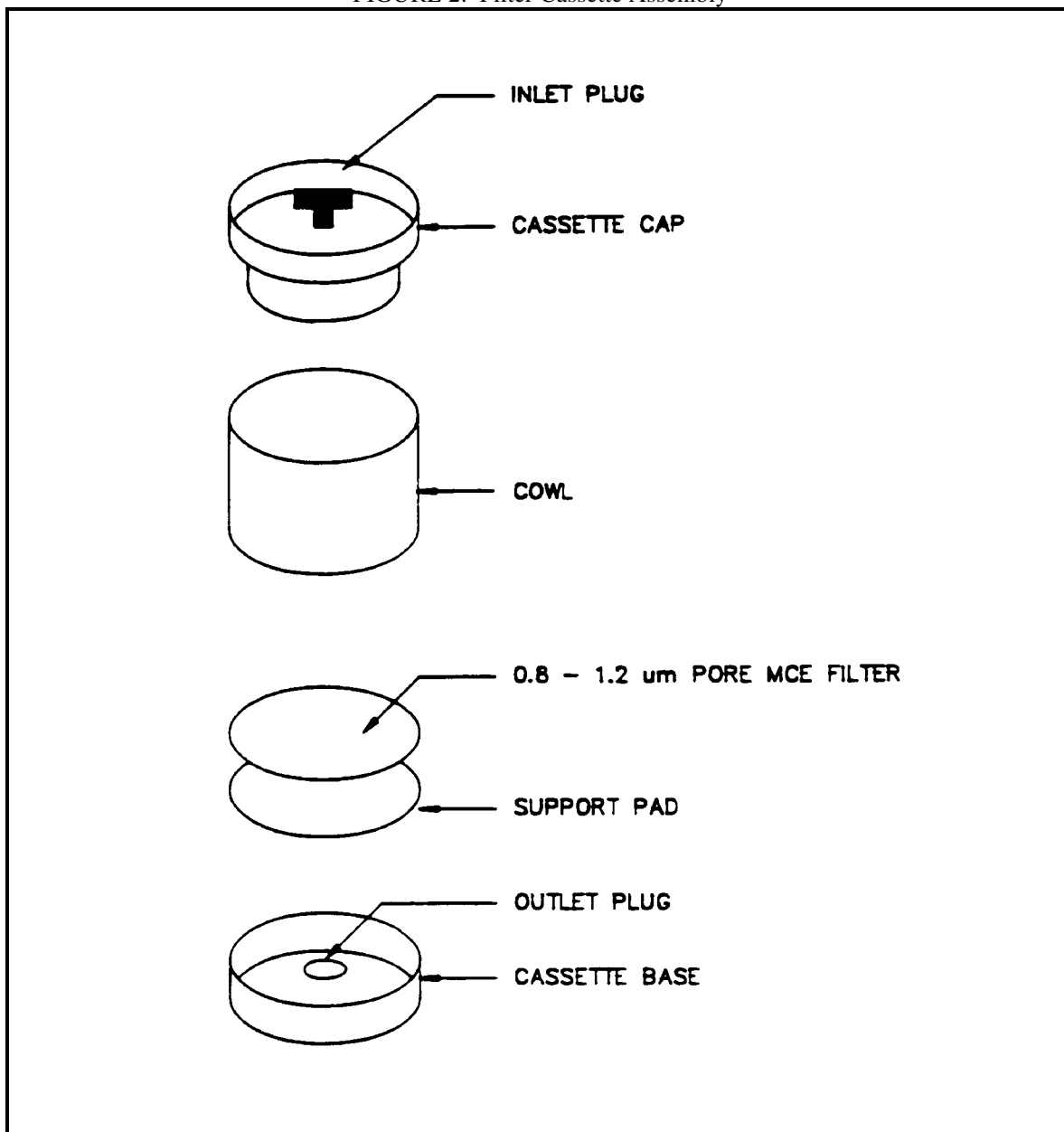
FIGURE 1. Calibration Train with Low Volume Sampling Pump



APPENDIX B (Cont'd)

Figures

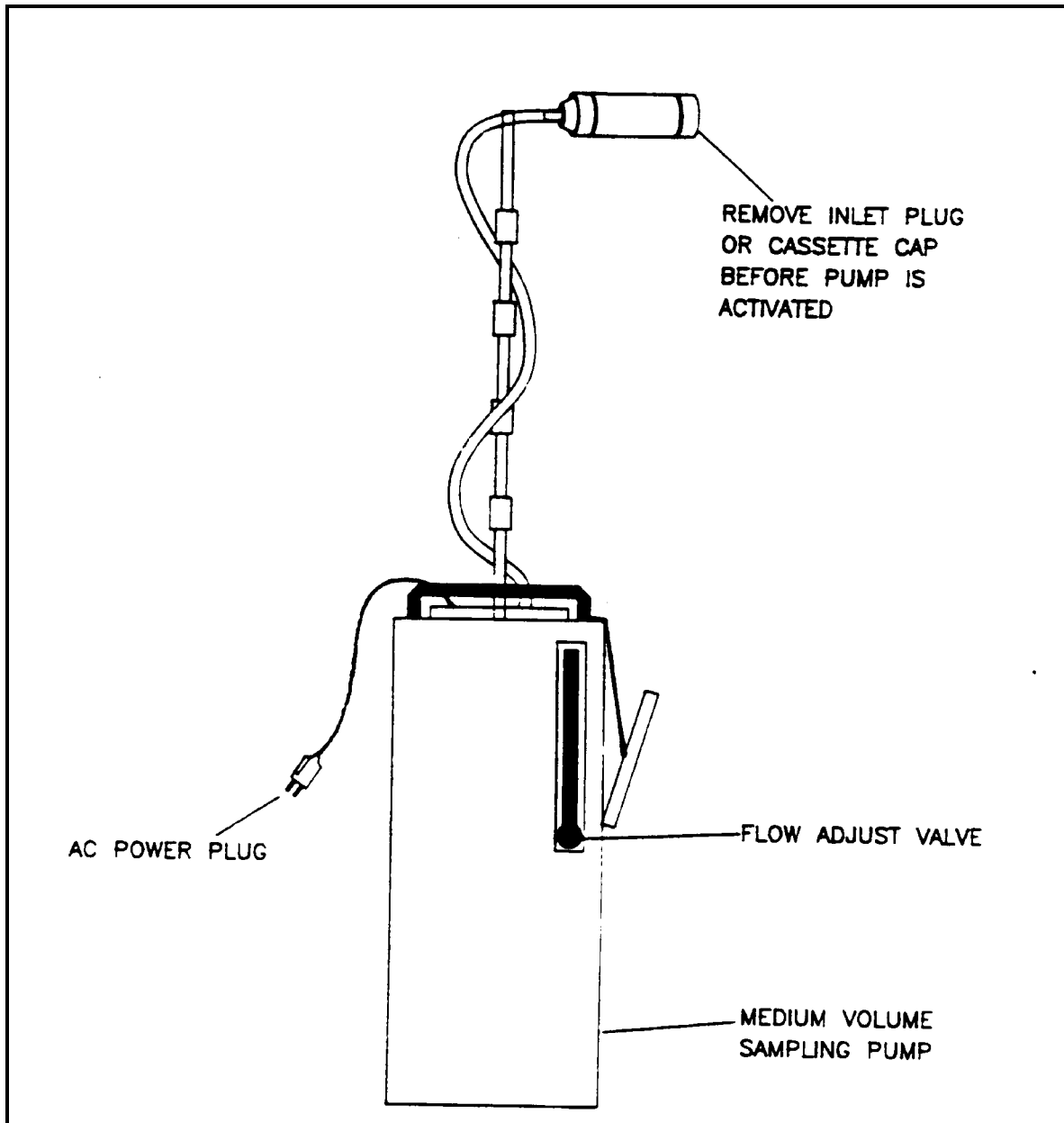
FIGURE 2. Filter Cassette Assembly



APPENDIX B (Cont'd)

Figures

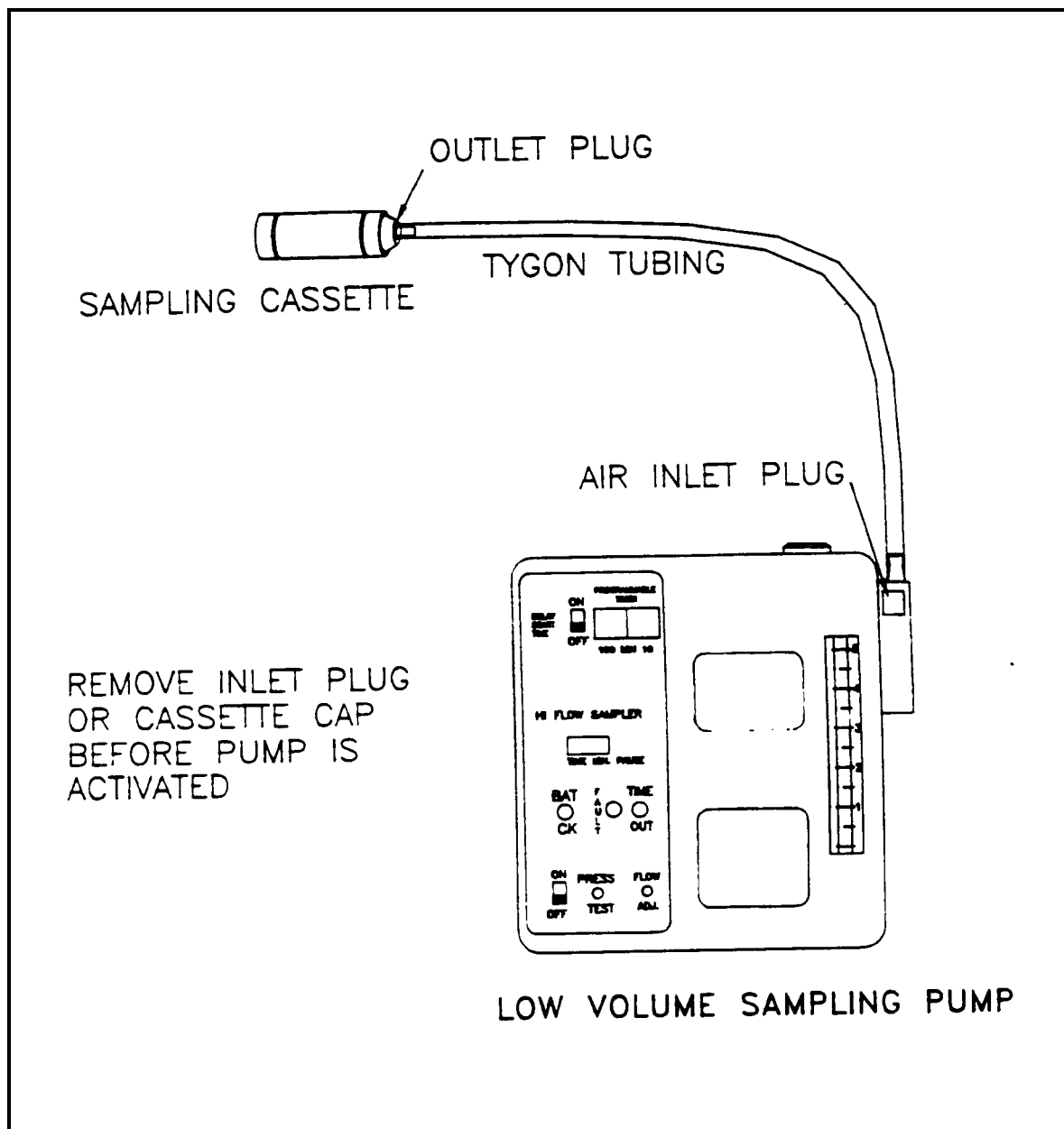
FIGURE 3. Medium Volume Sampling Train



APPENDIX B (Cont'd)

Figures

FIGURE 4. Sampling Train with Low Volume Sampling Pump



Attachment J

New York State Generic Community Air Monitoring Plan

APPENDIX B
SAMPLING AND ANALYSIS PLAN

APPENDIX B SAMPLING AND ANALYSIS PLAN

Remedial Action at Parcel B and Upper Parcel C of the Li Tungsten Property of the Li Tungsten Superfund Site

**Prepared at the Order of the
Environmental Protection Agency**

June 2006

**ECC
1746 Cole Blvd., Bldg. 21, Suite 350
Lakewood, Colorado 80401**



LIST OF ACRONYMS AND ABBREVIATIONS

C_A	Average Concentration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CL	Confidence Level
CSS	Characterization Sampling and Surveys
DCGL	Derived Concentration Guideline Limits
DCGL_{EMC}	Derived Concentration Guideline Limits (small area)
DCGL_W	Derived Concentration Guideline Limits (large area)
DCQR	Data Quality Control Report
EDS	Explanation of Significant Difference
EPA	Environmental Protection Agency
EMC	Elevated Measurement Unit
F_A	Area Factor
FSS	Final Survey Status
GPS	Global Positioning System
H₀	Null Hypothesis
H_a	Alternative Hypothesis
HEPA	High Efficiency Particulate Air
HPT	Health Physicist Technician
LBGR	Lower Boundary of the Gray Region
MAC	Material Acceptance Criteria
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
m²	square meters
MDA	minimal detectable activity
MDC_{scan}	minimal detectable concentration
mg/kg	milligrams per kilogram
NaI	Sodium Iodide
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
pCi/g	picocuries/gram
PHP	Project Health Physicist
Ra	Radium
RASS	Removal Action Support Surveys
ROD	Record of Decision
Th	Thorium
TLD	Thermal Luminescent Detectors
WAC	Waste Acceptance Criteria
WRS	Wilcoxon Rank Sum
XRF	X-ray Fluorescence

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Li Tungsten Superfund Site
Glen Cove, New York*

1.0 TECHNICAL APPROACH FOR SOIL SAMPLING DESIGN

The remedial activities to be conducted at Parcel B and Upper Parcel C of the Li Tungsten Superfund Site (the Site) include the excavation and offsite disposal of soils contaminated with radionuclides and soils contaminated with metals to satisfy the Site Cleanup Criteria specified in the Record of Decision (ROD).

In May 2005, the EPA, Region 2, issued an Explanation of Significant Differences (ESD) concerning the Li Tungsten Superfund Site. The EPA issued the ESD to change the radiological cleanup criteria to address the City of Glen Cove's decision to revise the Glen Cove Creek waterfront revitalization plan to include residential future use of the Site.

Compliance with Site Cleanup Criteria will be demonstrated using the procedures in the Multi-Agency Radiological Site Survey and Investigation Manual (MARSSIM) (EPA 402-R-97-016) and Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). A single Final Status Survey Plan for the Li Tungsten site addressing compliance with the ROD criteria utilizing MARSSIM and SW-846 components will be submitted after pre-excavation sampling is completed. A statistical analysis of the data obtained from the pre-excavation sampling will provide the basis of the number of samples to be collected during the final status survey.

1.1 Final Status Survey Design

MARSSIM defines a *survey unit* as a geographical area of specified size and shape for which a separate decision will be made whether or not that area meets the release criteria. This decision is made following a Final Status Survey (FSS) of the survey unit. Thus, a survey unit is an area for which a FSS is designed and conducted; data is evaluated; and, ultimately, results in a release decision. The FSS obtains data required for making the release decision, while avoiding the collection and analysis of an excess number of samples.

Usually, one of the following two conditions will lead to the determination that a particular survey unit requires further cleanup prior to being released for unrestricted use:

- The average level of residual radioactivity within the survey unit exceeds the cleanup criteria; or
- Small areas within the survey unit exhibit elevated residual radioactivity.

Sampling at discrete points within the survey unit will address the first condition (i.e., relatively uniform contamination). As used here, the term sampling refers to obtaining data from a subset of a population. Sampling includes both direct in-situ measurements and the collection of physical samples for laboratory analyses.

Sampling at discrete points within a survey unit may not be an efficient method of determining whether the second condition exists. Scanning is the preferred method for detecting isolated areas of elevated radioactivity.

A major component of survey designs is the efficient use of sampling at distinct locations

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combined with scanning to accurately determine the final status of a survey unit. The statistical procedures described in this section are used to establish the number of samples which will be collected at distinct locations and which will be necessary to determine if the average concentration in the survey unit exceeds the regulatory limit, with a specified degree of precision. Thus, these statistical procedures are essential in the planning and design of the FSS and the analysis and interpretation of the resulting data.

The survey and sampling approach for the Site described below encompass both sampling at discrete points and scanning of the excavation. In this manner, both the average level of residual radioactivity and areas of elevated residual radioactivity exceeding the cleanup criteria are addressed.

1.2 Release Criteria

The objective of remedial activities at the Site is to obtain the radiological and chemical (metals) release of the site without concern for excessive radioactive and chemical exposure to the general public. The Derived Concentration Guideline Limit (DCGL) is the soil cleanup criteria for both radiological and metals contaminants established in the ROD. Table 1-1 summarizes the site-wide soil cleanup levels established by the EPA and specified in the ROD, as adjusted by the ESD issued in 2005.

**Table 1-1
Site-Wide Cleanup Levels**

Parameter	Cleanup Levels
Arsenic (soil)	24 mg/kg
Lead (soil)	400 mg/kg
Arsenic (sediments) ^a	6 mg/kg
Lead (sediments) ^a	31 mg/kg
Thorium-230 + Thorium-232 (soil)	≤ 5 pCi/g plus background level ^b
Radium-226 + Radium-228 (soil)	≤ 5 pCi/g plus background level ^b
PCBs in the dumping area (middle) of Parcel B (soil)	1 mg/kg in the top 2 feet
PCBs in the dumping area (middle) of Parcel B (soil)	10 mg/kg in below 2 feet

^a There are no locations in Parcels B and Upper Parcel C to which the criteria apply. Sediment criteria were obtained from the *Technical Guidance For Screening Contaminated Sediment*, (Technical Guidance). Criteria are identified as “To Be Considered” ARARs. As defined in the Technical Guidance, sediments are “a collection of fine-, medium-, and coarse- grain materials and organic particles that are found at the bottom of lakes and ponds, rivers and streams, bays, estuaries, and oceans”. Criteria for arsenic and lead are based on oligotrophic waters with low concentrations of metals-complexing ligands and are over protective when applied to eutrophic waters. (The Technical Guidance further cautions that a decision to remediate should not be based on exceedances of these criteria.) No areas have been identified within Parcels B and Upper Parcel C that meet the definition of sediment or the criteria upon which the sediment screening criteria are based.

^b Background levels are 1 picocurie per gram (pCi/g) each for Th-230, Th-232, Ra-226, and Ra-228.

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1.3 Derived Concentration Guideline Levels

For remediation activities at the Site, the DCGL may be adjusted to address both wide range and localized residual contamination. The DCGL is referred to as the large area DCGL (DCGL_W) and the small area DCGL (DCGL_{EMC}).

The DCGL_W assumes that residual radioactivity is uniformly distributed over a wide area (i.e., the entire site). The DCGL_W is the cleanup criteria specified in the ROD.

Radiological release criteria are the sum of Ra-226 and Ra-228, and the sum of Th-230 and Th-232. Maximum reported concentrations for individual radionuclides are summed and compared to the release criteria and ratioed to the respective limit as a fraction and the summation of the individual isotope fractions are less than unity (i.e., 1). Unity is separate for the radium and the thorium radionuclides, as the cleanup criteria are not necessarily dose dependant. The mixture sum is stated as the condition:

$$\sum C_i/SG_i \leq 1$$

where;

C_i = concentration of the i^{th} radionuclide (pCi/g), and
 SG_i = soil guideline of the i^{th} radionuclide (pCi/g).

Theoretical maximum concentrations of individual radionuclides of concern can be established using site-specific ratios of Ra-226 and Th-232 as supported by previous site investigations.

Reported analytical results for Ra-226 and Th-232 were obtained from the Final Remedial Design Report. (URS, 2002) Th-232 and Ra-228, as well as Th-230 and Ra-226, are anticipated to be in secular equilibrium in soils located at the site. Table 1-2 presents a total of 26 samples selected from previous investigations with reported analytical results for Ra-226 and Th-232. For each sample, the ratio of Th-232 to Ra-226 was calculated. An average of the ratios of Th-232 to Ra-226 was calculated to be 1.32. This ratio can then be applied to determine the relative ratio of Ra-226 to Ra-228, and for Th-232 to Th-230.

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Table 1-2
Reported Analytical Results of Previous Investigations and Ratios

Sample ID	Th-232 (pCi/g)	Ra-226 (pCi/g)	Ratio Th-232 to Ra-226
BN010R260-1	0.941	0.809	1.16
BN050R275-0	1.62	2.12	0.76
BN090E2800/2	4.53	6.97	0.65
BN130E300-1	0.974	0.625	1.56
BN150E270-3	0.888	0.704	1.26
BN170E290-3	1.01	0.719	1.40
BS020E255-0	1.28	0.918	1.39
BS030E290-1	1.48	1.49	0.99
BS030E320-0	1.54	0.962	1.60
CN010E220-2	0.856	0.961	0.89
CN030E220-1	1	0.68	1.47
CN035E150-3	0.625	0.425	1.47
CN035E150-4	0.824	0.323	2.55
CN055E095-3	0.739	0.386	1.91
CN080E150-0/1	1.06	0.471	2.25
CN095E140-5	1.52	1.04	1.46
CN125E185-3	1.01	0.691	1.46
CPN040E000SS	0.693	0.56	1.24
CPN135E110SS	0.466	0.398	1.17
DUP-16	0.66	0.939	0.70
DUP-17	20.6	10.4	1.98
DUP-3	0.573	0.583	0.98
DUP-4	1.36	0.939	1.45
DUP-9	4.2	6.94	0.61
DWC-12-E2	65.6	397	0.17
DWC-4	18.6	11.3	1.65

Using the ratio calculated for Th-232 to Ra-226, radionuclide specific maximum concentrations can be determined for purposes of demonstrating compliance to the release criteria. The calculation of the maximum concentration of Th-232 in relation to the total concentration of Th-232 and Th-230 is provided as an example.

$$F_{Th-232} = \frac{X_{Th-232}}{X_{Th-232} + X_{Th-230}}$$

where:

$$\begin{array}{llll} F_{Th-232} & = & \text{Fraction of Th-232} & \\ X_{Th-232} & = & \text{Relative value of Th-232} & = 1.32 \\ X_{Th-230} & = & \text{Relative value of Th-230} & = 1.0 \end{array}$$

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The value of F_{Th-232} is calculated as 0.57. The maximum concentration of Th-232 is then calculated as:

$$C_{Th-232} \leq F_{Th-232} \times DCGL_{Th-232+Th-230}$$

where:

$$\begin{aligned} C_{Th-232} &= \text{Concentration of Thorium-232} \\ F_{Th-232} &= 0.57 \\ DCGL_{Th-232 + Th-230} &\leq 5 \text{ pCi/g plus background} \end{aligned}$$

The maximum concentration of Th-232 is then calculated as less and equal to 2.8 pCi/g. Table 1-3 lists the calculated maximum concentration for each of the radionuclides of concern. Values presented in Table 1-3 will be used to evaluating the elevated measurement comparison (EMC) and the adequacy of the scanning method selected for the remedial action support and final status surveys.

Table 1-3
Maximum Concentrations of Radionuclides of Concern

Parameter (In Soil)	Release Criteria
Th-230 and Th-232, combined	$\leq 5 \text{ pCi/g plus background}$
<i>Maximum concentration Th-232</i>	$\leq 2.85 \text{ pCi/g (excluding background)}$
<i>Maximum concentration Th-230</i>	$\leq 2.15 \text{ pCi/g (excluding background)}$
Ra-226 and Ra-228, combined	$\leq 5 \text{ pCi/g plus background}$
<i>Maximum concentration Ra-226</i>	$\leq 2.15 \text{ pCi/g (excluding background)}$
<i>Maximum concentration Ra-228</i>	$\leq 2.85 \text{ pCi/g (excluding background)}$

The $DCGL_{EMC}$ assumes that residual radioactivity is concentrated in a much smaller area and represents a small percentage of the survey unit.

The $DCGL_{EMC}$ may be greater than but not less than the $DCGL_W$. The ratio of the $DCGL_{EMC}$ to the $DCGL_W$ defines a radionuclide-specific area factor, F_A , and is defined as:

$$DCGL_{EMC} = (F_A)(DCGL_W)$$

when the residual radioactivity is confined to an area of size, A . The method for calculating the $DCGL_{EMC}$ is discussed in Section 2.3, *Elevated Measurement Comparison*.

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1.4 Background Reference Areas

A background reference area is a geographical area from which representative samples of background conditions are selected for comparison with samples collected in specific survey units at the remediated site (NUREG 1505). The background reference area has similar physical, chemical, radiological, and biological characteristics to the site being remediated, but is not contaminated by site activities (NUREG 1505). The distribution of background measurements in the reference area should be the same as that expected if the reference area was contaminated.

Additional reference samples may be taken from sampling locations if required to meet the criteria of the statistically determined number of final status survey samples. The radioisotope specific activity values obtained from these investigations will be adjusted using DCGLs, compared to the survey unit, and used to determine if the site cleanup criteria were achieved.

1.5 Survey Unit Classification

Portions of the Site have been classified as impacted or non-impacted. According to MARSSIM, impacted areas have a potential for radioactive contamination (based on historical data) or contain known radioactive contamination (based on past or preliminary radiological surveillance). This includes areas where:

- Radioactive materials were used and stored;
- Records of spills, discharges, or other unusual occurrences resulting in the spread of contamination; and
- Radioactive material was buried or disposed.

Areas immediately surrounding or adjacent to these locations are included in this classification due to the potential for the inadvertent spread of contamination.

Non-impacted areas are those areas identified through knowledge of site history or previous survey information where there is no reasonable possibility for residual radioactive contamination. The criteria used for this segregation need not be as strict as those used to demonstrate final compliance with site cleanup criteria.

Areas with the potential for residual contamination (impacted areas) are further divided into one of three groups, as defined by MARSSIM:

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Class 1 Areas - Areas that have, or had prior to remediation, a potential for radioactive contamination (based on site operating history) or known contamination (based on previous radiological surveys). Examples of Class 1 areas include:

- Site areas previously subjected to remedial actions;
- Locations where leaks or spills are known to have occurred;
- Former burial or disposal sites;
- Waste storage sites; and
- Areas with contaminants in discrete solid pieces of material with high specific activity.

Class 2 Areas - These areas have, or had prior to remediation, a potential for radioactive contamination or known contamination, but are not expected to exceed the $DCGL_W$. Changing the classification of an area from Class 1 to Class 2 must be justified by showing that the existing data (scoping surveys or characterization surveys) provides a degree of confidence that no individual measurement will exceed the $DCGL_W$. Other justifications for a change in the classification of an area may be appropriate based on the outcome of the data quality objective process. Examples of areas that might be classified as Class 2 for the FSS include:

- Locations where radioactive materials were present in an unsealed form (e.g. process facilities);
- Potentially contaminated transport routes;
- Areas downwind from stack release points;
- Upper walls and ceilings of some buildings or rooms subjected to airborne radioactivity; and
- Areas on the perimeter of former contamination control areas.

Class 3 Areas - Impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the $DCGL_W$, based on site operating history and previous radiological surveys. Examples of areas that might be classified as Class 3 include:

- Buffer zones around Class 1 or Class 2 areas; and
- Areas with very low potential for residual contamination but insufficient information to justify a non-impacted classification.

Areas excavated for radiological purposes at the Site will be designated Class 1 Areas. Locations of areas that may exceed the cleanup criteria are presented in the Remedial Design of the Li Tungsten Superfund Site (URS Corporation, 2001). The haul road between RB-A and RB-B will be designated as a Class 2 survey unit. The remainder of the site was surveyed and cleared per MARSSIM during the RD and thus will be treated as non-impacted.

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1.6 Statistical Concepts

This section introduces several terms and concepts associated with the statistical compliance verification methods implemented at the Site.

1.6.1 Null and Alternative Hypothesis

The decisions necessary to determine compliance with the soil cleanup criteria are based on precise statistical statements called hypotheses. These hypotheses will be tested using data from a survey unit. The state that is presumed to exist is expressed as the Null Hypothesis (H_0). For a given Null Hypothesis, a specified Alternative Hypothesis (H_a) is presented to express what is believed to be the state of reality if the null hypothesis is not true.

The hypotheses selected for the Site are as follows:

Null Hypothesis (H_0): The average concentration in the survey unit exceeds the average concentration in the reference area by more than the $DCGL_W$.

Alternative Hypothesis (H_a): The average concentration in the survey unit exceeds the average concentration in the reference area by less than the $DCGL_W$.

These hypotheses were chosen because the burden of proof is on the Alternative Hypothesis and is often referred to as Scenario A. Therefore, the survey unit will not be released until proven to satisfy the cleanup criteria. The measured average concentration in the survey unit must be less than the $DCGL_W$ in order to pass.

These hypotheses also were chosen because contamination below the $DCGL_W$ is measurable. Releasing a survey unit that requires additional remediation is an unacceptable alternative.

1.6.2 Type I and Type II Errors

As suggested above, there are two types of decision errors that can be made when performing the statistical tests described in this document; Type I error and Type II error. These designations are used to describe the relationship of errors to the Null and Alternative Hypothesis.

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Type I Errors

A Type I error occurs when the Null Hypothesis is rejected when it is actually true. A Type I error is commonly referred to as false positive. The probability of a Type I error is denoted by α (alpha). Alpha is sometimes referred to as the size of the test. For example, with α set at 0.25, it is expected that 75% of the time the Null Hypothesis will be evaluated properly. Only 25% of the time the Null Hypothesis may be rejected when it is true.

The outcome of the Type I error would be a survey unit was released even though it had residual activity in excess of cleanup criteria. To reduce the probability of this occurring at the Site, α is set at 0.05. Therefore, it is expected that 95% of the time the Null Hypothesis will be evaluated properly and 5% of the time the Null Hypothesis may be rejected when it is true.

Type II Errors

A Type II error occurs when the Null Hypothesis is not rejected when it is actually false. A Type II error is commonly referred to as a false negative. The probability of a Type II error is usually denoted by β (beta). For example, with β set at 0.25, it is expected that 75% of the time the Null Hypothesis will be correctly rejected when it is false. Only 25% of the time will it be accepted when it is false.

The outcome of a Type II error would result in the further excavation of a survey unit that meets the cleanup criteria. To reduce the risk of a Type II error at the Site, β was set at 0.05.

1.6.3 Relative Shift

This section introduces several terms and statistical parameters that will be used to determine the number of data points needed to properly apply the non-parametric tests. The upper bound of the gray region is defined as the $DCGL_W$, and the lower bound of the gray region (LBGR) is a site-specific variable generally initially selected to equal one half the $DCGL_W$, and adjusted to provide an acceptable value for the relative shift.

The lower boundary of the gray region (LBGR) and the target values for α and β are selected during the data quality objective process. The width of the gray region, is a parameter that is central to Wilcoxon Rank Sum (WRS) test. This parameter also is referred to as the shift, Δ . The absolute size of the shift is actually of less importance than the relative shift Δ / σ , where σ is an estimate of the standard deviation of the measured values in the survey unit. This estimate of σ includes both the real spatial variability in the quantity being measured and the precision of the chosen measurement system. The relative shift, Δ / σ , is an expression of the resolution of the measurements in terms of measurement uncertainty.